Total No. of Questions : 12]

SEAT No. :

P1019

[Total No. of Pages : 3

[4163] - 121
T.E. (Computer Engg.)
DATABASE MANAGEMENT SYSTEMS
(2003 Pattern) (Sem. - I) (Common to IT)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A reputed general hospital has decided to computerize their operations. In the hospital many doctors are working. Personal information of doctors are maintained to get them fixed salary per month. The patients are admitted to the hospital into the room. They are treated by various doctors. Sometimes patients performs certain pathological tests which carried out into the labs. **[8]**

i) Identify all entities.

ii) Identify all relations and connectivities among entities.

iii) Draw E-R Diagram.

b) What are the advantages of DBMS over conventional file processing system. **[6]**

c) What are the functions of DBA? **[4]**

OR

Q2) a) Explain in detail : **[8]**

i) Specialization and generalization in E-R model.

ii) Different levels of data abstraction.

b) What are the rules for converting E-R into relational model. Explain with example. **[10]**

Q3) a) Specify CODDs norms to be specified by RDBMS. **[8]**

b) Describe the concept of cursor and how it is used in embedded SQL. Explain various commands in embedded SQL. **[8]**

OR

P.T.O.

Q4) a) Explain the concept of referential integrity? Explain with example. **[8]**

b) Consider relation schemas

Player (Pno, name), Game (gno, gname, country) and Player-game (pno, gno, date)

Solve the following queries either in SQL or in relational algebra. **[8]**

i) Find the list of players playing "football"

ii) List all available games in 'INDIA'

iii) Find the list of players and games played on "27-03-2012"

iv) Find the names of players who are staying in the same country as "Sachin" is staying.

Q5) a) For relation schema R = (A, B, C, D, E) Compute the closure F + and canonical cover Fc of the following set F of functional dependencies (A--> BC, CD--> E, B--> D, E-->A). **[8]**

b) Explain why 4NF is a normal form more desirable than BCNF. **[8]**

OR

Q6) a) Consider R(A,B,C,D,E) with F defined as A-->B, CD-->E, A-->C, B-->D, E-->A Compute the closure of attributes set AD. (Hint: compute AD+) **[8]**

b) Describe desirable properties of decomposition. Use Armstrong's axioms to prove the soundness of the decomposition rule. **[8]**

SECTION - II

Q7) a) Write in detail various RAID levels and the factors to be taken into account when choosing a RAID level. **[10]**

b) Explain Hash Join algorithm. **[8]**

OR

Q8) a) Describe the B+ tree insertion algorithm and explain how it eliminates overflow pages. Under what conditions can an insert increase the height of the tree. **[10]**

b) Differentiate between static and dynamic hashing with example. **[8]**

Q9) a) When do deadlocks happen, how to prevent them, and how to recover if deadlock takes place? **[8]**

b) Explain recoverable and cascadeless schedules. **[8]**

OR

Q10)a) Explain deferred database modification and immediate database modification and their difference in the context of recovery. **[8]**

b) Explain two-phase locking protocol. How does it ensure serializability?**[8]**

Q11)a) Design Object Relational Database for composite attribute, Multi-valued attributes and inheritance using SQL syntax with suitable example. **[8]**

b) Explain advantages and disadvantages of hardware pointer swizzling techniques. **[8]**

OR

Q12)a) Explain the various issues that decide the time cost of communication between client and server. **[8]**

b) Define Data mining. Explain any Association Rule technique with suitable example. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1020

[Total No. of Pages : 3

[4163] - 122
T.E. (Computer)
DATA COMMUNICATIONS
(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the working of superhetrodyne AM receivers with suitable block diagram. What are advantages of this receiver? **[8]**

b) Explain Qudrature Amplitude Modulation (QAM). What are its advantages. **[8]**

OR

Q2) a) Describe the terms ASK, FSK, PSK. What is the significance of these types of Modulation system? **[6]**

b) Draw and Explain the block diagram of a Frequency Mixer (Converter). Where it is used? **[6]**

c) Explain in short the need of Pre-emphasis and De-emphasis. **[4]**

Q3) a) Explain the significance of Quantization in Analog to Digital conversion. Also describe what is Uniform and Non Uniform quantization. **[8]**

b) Encode the following binary data stream into polar RZ, polar NRZ, Bipolar NRZ (AMI) and Manchester Codes **[8]**

Data stream : 11000010

OR

P.T.O.

Q4) a) Explain meaning of intersymbol interference. What is the cause behind? **[6]**

b) Differentiate between Ideal sampling and Flat top sampling. **[4]**

c) Explain in short what is PWM along with its advantages. **[6]**

Q5) a) Explain in detail Delta Modulation. Draw block diagrams of delta modulator and demodulator. What are its advantages over PCM. **[10]**

b) Describe in short Pulse Code Modulation. What are its advantages? Where it is used. **[8]**

OR

Q6) Write short note on: **[18]**

a) T1 Carrier

b) Adaptive Delta Modulation

c) Scramblers

SECTION - II

Q7) a) Describe the following terms: **[8]**

i) Hamming weight of a code word

ii) Hamming distance

iii) Code efficiency

iv) Entropy and Information rate.

b) What is the significance of Entropy in communication system? How it is Expressed mathematically? **[4]**

c) Comment on the Shannon's Theorem on channel capacity. **[4]**

OR

Q8) a) Explain the working of Stop and Wait protocol. What are the drawbacks associated and how to overcome it? **[8]**

b) What is CRC? Compute the polynomial checksum for a Frame 1101011011 using the generator $G(x) = X^4 + X + 1$ **[8]**

Q9) a) Comment on the significance of the various channels used in ISDN? Also specify the terms BRI and PRI. **[8]**

b) What is Frame Relay Service? Comment on the important characteristics associated with Frame Relay service. **[8]**

OR

Q10)a) Discuss a typical ADSL network architecture. **[8]**

b) Draw and Explain the ATM Cell header structure at User-network Interface. **[8]**

Q11)a) Comment on the TCP/IP protocol Stack. How it is different than OSI 7 layer Model. **[6]**

b) Explain in short various physical topologies. Which topology is widely Used today and why? **[6]**

c) Describe the working of CSMA/CD protocol used in Ethernet network. **[6]**

OR

Q12)a) Comment on the significance of Physical address and IP address with suitable example. **[6]**

b) An organization is required to setup a network of 25 PCs. Comment on the various components required. Which physical medium is suitable? Also draw the topology of this network. **[6]**

c) Comment on the various categories of Unshielded Twisted pair cable along with data rates supported. **[6]**

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Total No. of Questions : 12]

SEAT No. : ____

P1023

[Total No. of Pages : 3

[4163] - 126
T.E. (Computer)
PRINCIPLES OF PROGRAMMING LANGUAGES
(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answers any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different issues to take into considerations while deciding programming language quality. **[8]**

b) State and Explain Properties of Structured and Non Structured data types. **[8]**

OR

Q2) a) Explain key features of Logic and Functional Programming paradigms. **[8]**

b) With suitable examples demonstrate. **[8]**

i) Derived and Abstract data type.

ii) Scalar and Composite data type.

Q3) a) When would you use a parameter that is a pointer? When would you use a parameter that is a reference? Explain advantages and disadvantages of each. **[8]**

b) Explain following terms with suitable examples. **[8]**

i) Exception and Exception handler.

ii) Raising an Exception.

iii) Build in Exception.

iv) Continuation.

OR

P.T.O.

Q4) a) Define following terms related to variables. **[8]**

i) Static

ii) Stack dynamic

iii) Explicit heap dynamic

iv) Implicit heap dynamic.

b) What do you mean by exception handling? List and explain predefined conditions for which exception handling is possible. **[8]**

Q5) a) What is significance of Statement oriented and Block Oriented structure programming? **[6]**

b) What are variant records? Explain how variant records are implemented in 'C' and 'Pascal'. **[8]**

c) Explain precedence level of PASCAL for expression evaluation. **[4]**

OR

Q6) a) Explain purpose of declaration with respect to . **[8]**

i) Choice of storage representation.
ii) Storage management
iii) Polymorphic operations
iv) Type Checking.

b) Explain Concept of Local, Non local, Global variables in PASCAL with suitable examples. **[8]**

c) What is difference between following initializations: **[2]**

char a [ ] = "string literal"

char *P = "string literal"

SECTION - II

Q7) a) State and Explain key features of Object oriented Programming. **[4]**

b) Explain importance of following with respect to JAVA. **[8]**

i) Access specifications.

ii) Interfaces

c) Explain the typical phases associated with Applet Life Cycle. **[6]**

OR

Q8) a) With the help of neat diagram, explain major phases associated with. NET framework development process. **[6]**

b) How C# is better than C++ and Java **[6]**

c) What is Package? What is importance of following JAVA packages? **[6]**

i) java.lang

ii) java.awt

iii) java.util

iv) java.io

v) java.net

Q9) a) Write a short note on Applications of logic programming. **[4]**

b) What is relationship between Resolution and Unification in Prolog **[6]**

c) Explain difference between Depth first search and Breadth first search to satisfy multiple Goals. **[6]**

OR

Q10)a) What is purpose of Instantiation, Matching and Unification with respect to Logic programming PROLOG? **[8]**

b) Explain following control predicates of PROLOG. **[8]**

i) The CUT

ii) If-then-else

Q11)a) Write a program in LISP to accept list of numbers and Sort the same in ascending order. Demonstrate dry running of your program. **[8]**

b) Write a LISP function to return sum of list elements. Demonstrate dry running. **[8]**

OR

Q12)a) Write a LISP function to calculate length of list. Demonstrate dry running. **[8]**

b) Explain following primary components of Functional programming language. **[8]**

i) Set of Data Objects

ii) Set of build-in-functions

iii) Set of Functional forms.

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Total No. of Questions : 12] **SEAT No. :**

P1024 **[Total No. of Pages : 2**

[4163] - 127
T.E. (Computer)
COMPUTER NETWORKS
(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three Question from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagram must be drawn whenever necessary.***
4) ***Figures to the right indicates full marks.***

SECTION - I

Q1) a) What is frame relay? Give some application of frame relay? **[8]**

b) What are the network design issues involved in designing a typical network. **[8]**

OR

Q2) a) What is the principal difference between connectionless and connection oriented protocol? Also compare TCP/IP and OSI reference model. **[8]**

b) Explain the physical layer access mechanisms and the MAC layer frame format for wireless LAN 802.11? **[8]**

Q3) a) If the unit exchanged at the data link level is called a frame and the unit exchanged at the network level is called a packet, do frames encapsulate packets or do packet encapsulate frames? Explain your answer? **[8]**

b) Which of the OSI layer handle each of the following: **[8]**

i) Dividing the transmitted bit stream into frames.

ii) Determine which route through the subnet to use.

OR

Q4) a) Explain at least three services implemented by sliding window protocol? **[8]**

b) Explain with the help of phase diagram. Working of PPP. List all the activities carried out during each phase? **[8]**

Q5) a) What is bridge? Explain the operation of a LAN bridge from 802.3 to 802.4. **[9]**

b) What is the basic purpose of MAC layer protocol? Explain function of Ethernet protocol? **[9]**

OR

P.T.O.

Q6) a) Discuss the connection management followed in Bluetooth technology. **[9]**

b) What will be the throughput if slotted ALOHA is used in place of ALOHA? Justify the variation in the throughput of ALOHA and slotted ALOHA through mathematical derivations. **[9]**

SECTION - II

Q7) a) A class B network on the internet has subnet mask of 255. 255. 255.0 what is the maximum no of host per subnet? **[8]**

b) Explain in detail Firewall operation. **[8]**

OR

Q8) a) Explain the following routing algorithm with example? **[8]**

i) Flooding routing algorithm.

ii) Hierarchical routing algorithm.

b) What is choke packet? How congestion is controlled over here? **[8]**

Q9) a) What is count to infinity problem? Explain it with suitable example? **[8]**

b) Explain in detail about the functions of transport layer including Connection establishment and release procedure. **[8]**

OR

Q10)a) Explain the congestion prevention policy of the Data link layer, Network layer, Transport layer? **[8]**

b) Explain three way handshakes in transport layer. **[8]**

Q11)a) How FTP works? Explain? **[9]**

b) What is WWW? How it works? What is the difference between static and dynamic web pages? **[9]**

OR

Q12)Write short notes on : **[18]**

a) MIME

b) LDAP

c) DNS

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Total No. of Questions : 12]

SEAT No. :

P1026

[Total No. of Pages : 3

[4163] - 129
T.E. (Computer)
SYSTEMS PROGRAMMING
(2003 Pattern) (Sem. -II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various language processing tools. **[8]**

b) Explain with example different parameter passing methods to a Macro. **[8]**

OR

Q2) a) Explain various data structures required for Pass I of Assembler. Give format of each. **[8]**

b) Differentiate between a function and a macro. **[4]**

c) Explain how nested macro calls are handled. **[4]**

Q3) a) Explain Compile-and-go loader in detail with its advantages and disadvantages. **[8]**

b) What is overlay structure? Explain use of it. **[4]**

c) Differentiate between static and dynamic linking. **[4]**

OR

Q4) a) Explain design of a absolute loader. **[8]**

b) Compare DLL and EXE file. **[4]**

c) Explain direct linking loader. **[4]**

P.T.O.

Q5) a) With diagram explain various phases of a compiler. **[10]**

b) Compare top-down and bottom-up parser. **[4]**

c) What is Bootstrap and Cross compiler? **[4]**

OR

Q6) a) For the following C program write down output generated by the Lexical Analyzer. Show contents of different tables generated. **[10]**

```
main()
{
int a,b,c;
a=5;
b=2;
c=a*b;
printf ("Multiplication is %d",c);
}
```

b) Explain Recursive Descent Parser with example. **[8]**

SECTION - II

Q7) a) With diagram explain various states of a process. **[4]**

b) Enlist and explain functions of Operating System. **[6]**

c) Explain FCFS job scheduling algorithm. **[8]**

OR

Q8) a) Consider the following set of processes. Assume the processes are arrived in the order P1, P2, P3, P4, P5 all at time 0. **[10]**

Process	Burst Time
P1	10
P2	1
P3	2
P4	1
P5	5

Draw the Gantt Chart for Round Robin scheduling algorithm (time quantum is 1). Calculate the waiting time and turnaround time of each process. Also calculate average turnaround and average waiting time.

b) Describe the difference between short term, medium term and long term scheduling. **[8]**

Q9) a) For the following reference string how many page faults will occur using LRU and FIFO page replacement scheme (page frame =3). Compare the results. **[8]**

5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5.

b) Explain the need of demand paging. **[8]**

OR

Q10)a) Explain concept of Virtual memory. **[8]**

b) Compare following - **[8]**

i) Internal and external fragmentation.

ii) Logical and physical address.

Q11)a) Explain with diagram Linked Allocation. **[8]**

b) What are different free space management techniques? Explain in detail. **[8]**

OR

Q12)a) Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143. The queue of pending requests in FIFO is:

86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130.

Starting from the current head position what is the total distance that the disk arm moves to satisfy all the pending requests for FCFS and SSTF disk scheduling algorithm. **[8]**

b) Explain different file access methods. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P1027

[Total No. of Pages : 3

[4163] - 130
T.E. (Computer Engineering)
SOFTWARE ENGINEERING
(2003 Pattern) (Sem. -II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is software process? Explain the various approaches for assessing the software process. **[6]**

b) Explain with neat diagram, the waterfall model for software development. Discuss its advantages and disadvantages. **[6]**

c) Explain the umbrella activities which are applied throughout the software Process. **[5]**

OR

Q2) a) What is the purpose of CMM I? List and explain generic goals and practices for project planning process area. **[9]**

b) Explain Spiral model with its advantages and disadvantages. **[8]**

Q3) a) What are the objectives of Software Testing? Explain different testing principles. **[9]**

b) Explain the importance of modeling practices. Explain the principles of Analysis Modeling. **[8]**

OR

Q4) a) Explain in detail - System modeling using UML. **[6]**

b) Explain Product engineering hierarchy with neat labeled diagram. **[6]**

c) Explain, what is generalization? And what is its purpose in UML. **[5]**

P.T.O.

Q5) a) Explain the Data flow model and draw a level 0 and level 1 DFD for a student placement cell of an engineering college. **[8]**

b) What is quality function deployment? Explain the recruitments identified by QFD. **[8]**

OR

Q6) a) What are the objectives that the analysis model must achieve? State and explain any five rules of thumb that should be followed when creating the analysis model. **[8]**

b) For a hospital chain (e.g. Sahyadri Hospitals) make necessary scope assumptions, identify various use cases and depict them in neat diagram. **[8]**

SECTION - II

Q7) a) Explain with a suitable example along with all the steps: **[8]**

i) Transform - flow mapping to software architecture.

ii) Transaction - flow mapping to software architecture.

b) What is meant by cohesion and coupling criteria's that address the function independence. List all the types of cohesion. **[9]**

OR

Q8) a) Explain in detail the following : **[9]**

i) Architectural design elements.

ii) Component-level design elements.

iii) Deployment-level design elements.

b) What are the golden rules of interface design? Explain in detail all the rules. **[8]**

Q9) a) Explain the following testing strategies for conventional software: **[8]**

i) Regression Testing.

ii) Smoke Testing.

b) What are strategic issues in software testing? Explain in detail - **[9]**

i) Top-down integration testing.

ii) Bottom-up integration testing.

OR

Q10)a) Explain in detail basis path testing with following details :- **[9]**

i) Flow-graph notation

ii) Cyclomatic complexity

iii) Test case derivation.

b) What is the difference between verification and validation? Explain in detail testing principles and deployment issues. **[8]**

Q11)a) What is software quality? What are the mechanisms to address quality software? **[8]**

b) What are the objectives of software Maintenance? Explain in detail maintenance metrics. **[8]**

OR

Q12)a) What do you men by the term : measure, measurement and metrics. What are the attributes of effective software metric. **[8]**

b) Explain the metrics for source code. What are the factors affecting source code metric investigation? **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1033

[Total No. of Pages : 2

[4163] - 136
T.E. (Information Technology)
COMPUTER NETWORK TECHNOLOGY
(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define routing. Explain flooding routing algorithm. **[8]**

b) Design any class-C network of four equal subnets.
What is the network address and broad cast address of each subnetwork **[8]**

OR

Q2) a) Explain the working of Switch, Bridge and Router. **[8]**

b) Explain NAT in detail with appropriate diagram. **[8]**

Q3) a) Explain the TCP header in detail. **[8]**

b) Explain the Silly window syndrome used in TCP. **[8]**

OR

Q4) a) What is a socket? Explain various socket primitives used in client-server interaction. **[8]**

b) What is a congestion control mechanism? Explain leaky bucket and token bucket algorithms. **[8]**

Q5) a) Explain how DNS works. **[9]**

b) Explain five basic functions of an e-mail system. **[9]**

OR

Q6) Write short notes on : **[18]**

a) Resource records

b) FTP

c) Various types of web pages.

P.T.O.

SECTION - II

Q7) a) Differentiate SIP and H.323. **[8]**

b) Why do we require a different protocol for streaming stored audio/video? Explain in detail the protocols required. **[8]**

OR

Q8) a) Explain RTP and RTCP in detail. **[8]**

b) Explain voice over IP in detail. **[8]**

Q9) a) What is DHCP and DHCP relay agent? Explain the operation of DHCP. **[8]**

b) List and explain the principal components of network management architecture. **[8]**

OR

Q10) a) List 5 areas of network management and explain the necessity of each. **[8]**

b) Explain MIB along with its structure. **[8]**

Q11) Write short notes on : **[18]**

a) 802.11

b) ISDN

c) X-25

OR

Q12) Write short notes on : **[18]**

a) Bluetooth

b) Frame relay

c) ATM

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Total No. of Questions : 12]

SEAT No. :

P1035

[Total No. of Pages : 3

[4163] - 138
T.E. (Information Technology)
HUMAN COMPUTER INTERFACE
(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer Question1 or 2, 3 or 4 and 5 or 6 from section - I and Question 7 or 8, 9 or 10, and 11 or 12 from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the difference between mistakes and slips with the help of suitable example. **[8]**

b) Compare life critical system against commercial computer systems with reference to goals of user interface design. **[8]**

OR

Q2) a) Human memory plays an important role in how well people deal with an interface. Describe two important differences between Short-Term Memory and Long-Term Memory. **[8]**

b) What is reasoning? Explain different types of reasoning with examples. **[8]**

Q3) a) Explain stages of action model. Define gulf of evaluation and gulf of execution. **[8]**

b) Explain GOMS and keystroke level model. **[10]**

OR

Q4) a) Explain task objects and task actions as well as interface objects and interface actions to build computer interface for any one of the following systems: **[10]**

- Book Management System.
- Hotel Management System.

b) List and explain Shneiderman Eight Golden Rules of interface design. **[8]**

P.T.O.

Q5) a) Describe Heuristic Evaluation method: What steps comprise it, how and where is it used, how many evaluators are recommended, and where do the heuristics come from? **[8]**

b) Explain three Pillars of Interface Design. **[8]**

OR

Q6) Write short note on (Any two) **[16]**

a) Participatory Design

b) Affordances and Design

c) Scenarios and Patter.

SECTION - II

Q7) a) What are the factors you would need to take into account when designing a screen layout for a database application? **[8]**

b) Describe various command organization strategies. **[8]**

OR

Q8) a) Give one good feature and one bad feature of each of these interaction styles: **[8]**

i) question and answer

ii) natural language

iii) direct manipulation

iv) virtual reality

b) Explain advantages and disadvantages of direct manipulation with the help of example. **[8]**

Q9) a) Explain an importance of hypertext over linear paper document. List important considerations for creating a good hypertext document. **[8]**

b) Discuss important issues involved in designing a web page. **[8]**

OR

Q10)a) List and explain advantages and disadvantages of online help and off line help. **[8]**

b) Explain how following CSCW systems are useful for co-operative working. **[8]**

i) Meeting Rooms

ii) Shared Drawing Surfaces.

Q11)a) Speech recognition systems for Personal Computers are now becoming more affordable and useable. **[10]**

i) State two advantages to a PC user of a speech recognition system.

ii) Give two different tasks for which a PC user could take advantage of speech recognition.

iii) Speech recognition systems sometime fail to be 100 per cent effective in practice.

Give three reasons why this is so.

b) Give four benefits and three problems of touch screens and voice recognition input. **[8]**

OR

Q12)Write short notes on : **[18]**

a) Role of HCI in animation industry

b) Shared Editors

c) Ethnographic observation

d) Comparisons of pointing devices.

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Total No. of Questions : 12]

SEAT No. :

P963

[Total No. of Pages : 2

[4163] - 14
T.E. (Mechanical)
INDUSTRIAL ENGINEERING & MANAGEMENT
(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) *All questions are compulsory.*
2) *The options are given within the set of subquestions.*
3) *Assume suitable data, if necessary.*
4) *Draw neat diagrams wherever necessary.*
5) *Use of pocket non-programmable calculator is allowed.*

SECTION - I

Q1) a) Explain the role of industrial Engineering in improvement of performance of modern industries. **[8]**

b) What do you mean by performance rating? **[4]**

c) How method study differs from time study? Explain with suitable examples. **[6]**

OR

Q2) a) Discuss the various allowances considered in time study. **[6]**

b) Explain the use of charts & diagrams in method study. **[6]**

c) Explain in detail work sampling **[6]**

Q3) a) Explain the need of Ergonomics in modern industries. **[6]**

b) Write a short Note on "Anthropometry". **[6]**

c) Explain in brief man-machine system. **[4]**

OR

Q4) a) Explain any six guidelines to design a work space for any general type machine. **[8]**

b) Explain the relation between ergonomics & safety. **[8]**

P.T.O.

Q5) a) Explain the various theories of motivation. **[8]**

b) Differentiate between job evaluation & men't rating. **[8]**

OR

Q6) a) Explain how effective management results in improved performance of system? **[8]**

b) Explain the F.W. Taylor's concept of scientific management. **[8]**

SECTION - II

Q7) a) What do you mean by zero based budget (ZBB). State its advantages. **[6]**

b) What are the advantages of standard cost? **[6]**

c) Explain the concept of varience analysis. **[6]**

OR

Q8) a) Explain the following concepts: **[10]**

i) Transfer pricing

ii) Responsibility Accounting

b) Explain the difference between cost center & profit centre. **[8]**

Q9) a) How plant layout & material handling systems are related to each other? **[8]**

b) Explain the various factors considered for selection of plant layout. **[8]**

OR

Q10)a) Explain the various principles of material handling systems. **[8]**

b) State & explain the characteristics of good plant layout. **[8]**

Q11)a) What is selective inventory control? Explain any one in detail. **[8]**

b) Explain the functions of material planning department in an industry. **[8]**

OR

Q12)a) Explain in brief the following concepts: **[8]**

i) Kanban

ii) JIT

b) Explain the scope of Production Planning & Control (PPC) function in an industry. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P964

[Total No. of Pages : 4

[4163] - 15
T.E. (Mechanical Engg.)
(Common to Mech. Sand. for Sem. - II)
COMPUTER ORIENTED NUMERICAL METHODS
(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Unit-I

Q1) a) Explain the following terms with suitable example. **[6]**

i) Absolute Error

ii) Relative Error

iii) Algorithmic Error

b) Maximize the function $z = 3x + 2y$ subjected to following three conditions using simplex method. **[12]**

$x + y \leq 4$,

$x - y \leq 2$,

$x \geq 0, y \geq 0$.

OR

Q2) a) If $x = 3.26426$, find Absolute, Relative and percentage Error. **[6]**

If i) x is truncated to the 4^{th} decimal places.

ii) x is rounded to the 4^{th} decimal places.

b) If $u = 3v^7 - 6v$, find the percentage error in 'u' at v = 1, if error in 'v' is 0.05. **[6]**

c) Define & explain :- **[6]**

i) Constraints

ii) Objectivefunction

iii) Decision variable.

P.T.O.

Unit-II

Q3) a) The velocity distribution of fluid near a flat surface is given below. **[8]**

x	0.1	0.3	0.6	0.8
v	0.72	1.81	2.73	3.47

x is the distance from surface (mm) & v is the velocity $\left(\frac{\text{mm}}{\text{sec}}\right)$. Use lagranges interpolation polynomials to obtain the velocity at $x = 0.4$.

b) The following data gives, corresponding value of pressure & specific volume of superheated steam. **[8]**

V	2	4	6	8	10
P	105	42.7	25.3	16.7	13

find the equation of best fit curve through these point by law $PV^{-n}=C$.

OR

Q4) a) Given the values **[6]**

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

evaluate $f(g)$ means f(nine), using Newton's divided difference formula.

b) A set of values of x & y are given below, using least square technique, for a curve $y = a.e^{bx}$, find the value of a & b. **[10]**

x	0.1	0.2	0.3	0.4
y	1.832	2.238	2.733	3.338

Unit-III

Q5) a) Solve the equations, **[8]**

$$10x_1 + x_2 + x_3 = 12$$
$$x_1 + 10x_2 - x_3 = 10$$
$$x_1 - 2x_2 + 10x_3 = 9$$

by Gauss- Jordon Method.

b) Find $\frac{dy}{dx} \& \frac{d^2y}{dx^2}$ at $x = 3.8$ **[8]**

x	1	2	3	4
y	0	0.693	1.098	1.386

OR

Q6) a) Explain $\perp\cup$ Decomposition Method. **[8]**

b) The relation between x & y is defined by a function $y=\frac{x^2}{10}$, find $\frac{dy}{dx}$ & $\frac{d^2y}{dx^2}$. at $x = 6$.

The given values of x are 0, 1, 2, 3, 4, 5, 6. **[8]**

SECTION - II

Unit-IV

Q7) a) Using Newton Raphson Method, solve the following equation.

$x^3 - 5x + 3 = 0$ with initial value of $x = 0$. Do the three iterations only. **[8]**

b) Draw the flow chart for 'Simpson's $\frac{3}{8}^{th}$ rule' to find the area bounded by curve. **[8]**

OR

Q8) a) Find the integration of $x^3 + x - 1$ with the limits 1 to 4. Using Gauss - Legendre 2-point formula. **[8]**

b) Draw the flowchart for 'Regula Falsi Method'. **[8]**

Unit-V

Q9) a) using Runge-Kutta method, of fourth order to obtain the numerical solution of $\frac{dy}{dx}=\sqrt{x^2+y}$ find y at $x = 0.4$ with $y_{(0)} = 1$ & $h = 0.2$. **[8]**

b) Draw the flowchart for 'Euler's method'. **[8]**

OR

Q10)a) Using Modified Euler's method, solve the following equation. **[8]**

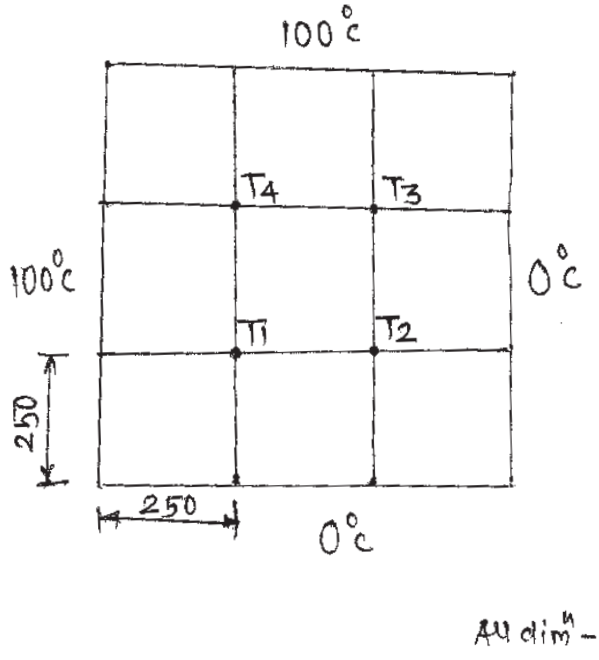
$\frac{dy}{dx}=1+xy$ with $y(0) = 1$, to find y at $x = 0.1$ & $x = 0.2$. Take $h = 0.1$ & accuracy up to five decimal places.

b) Draw the flowchart & computer programme for 'Runge - Kutta 2nd Order method. **[8]**

Unit-VI

Q11)a) A steel plate of 750 × 750 mm has it's adjacent sides maintained at 100°C, while the two sides are maintained at 0°C. What will be steady state temperature at interior points.

Assuming a grid size of 250 mm. **[10]**



b) Draw the flowchart for 'Poisson's Equation.' **[8]**

OR

Q12)a) Solve the boundary value problem,

$\frac{d^2y}{dx^2} - 64y + 10 = 0$ with y(0) = y(1) = 0 using finite difference method & calculate y(0.5) take step size, h = 0.25. **[10]**

b) Draw the flowchart for (1.D) one dimensional Heat equation. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P965

[Total No. of Pages : 8

[4163] - 16
T.E. (Mechanical)
TRANSMISSION SYSTEM DESIGN
(2003 Pattern) (Semester-II)

Time :4 Hours] ***[Max. Marks :100***

Instructions :

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit-I

Q1) a) Compare ball bearing with roller bearing. **[3]**

b) Explain the mounting and preloading of taper roller bearing with suitable sketch. **[4]**

c) A ball bearing carries a radial load of 500 N at 1760 rpm for 40% of time, 600 N at 880 rpm for 30% of time, 250 N at 1000 rpm for 10% time and no load at 1500 rpm for remaining period of cycle. If expected life of bearing is 10,000 Hrs. with 95% reliability, calculate. **[10]**

i) Basic dynamic load capacity of bearing.

ii) Average speed of bearing operation.

OR

P.T.O.

Q2) a) Derive stribeck's equation for static capacity of rolling contact bearing with assumptions. **[6]**

b) A single-row deep groove ball bearing is subjected to following work cycle. **[11]**

Fraction of cycle	Radial Load 'Fr' kN	Thrust Load 'Fa' kN	Radial factor 'X'	Thrust Factor 'Y'	Role Rotating	Service Factor	Speed RPM
1/10	2.0	0.35	1.0	0	inner	1.2	500
1/5	1.5	0.75	0.66	2.0	outer	1.75	600
3/5	5.0	1.15	0.66	2.0	inner	1.6	700
Remaining	1.0	–	1.0	0	outer	2.0	900

If desired rating life of bearing is 18,000 Hrs. Select bearing from following data.

Bearing No.	6011	6211	6311	6411
Dynamic capacity 'C' kN	28.1	43.6	71.5	99.5

Unit-II

Q3) a) Discuss heat dissipation in clutches and brakes. **[4]**

b) Draw a labelled sketch of multi-plate clutch and state equation for calculating no. of contacting surfaces (plates). **[4]**

c) A cone clutch with asbestos lining is used to transmit 35 kW power at 1540 rpm. The coefficient of friction between the contacting surfaces is 0.3 while the permissible intensity of pressure is 0.35 N/mm^2. The semi-cone angle is 12.5°. The mean radius of friction surface is twice face width. Assuming uniform pressure condition, find. **[9]**

i) Dimensions of friction lining.

ii) Axial force required to engage clutch.

OR

Q4) a) Discuss desirable properties of friction material and list out at least two friction materials. **[5]**

b) An automotive vehicle weighing 20 kN is moving on a level road at speed of 100 km/hr. When the brakes are applied, it is subjected to unifor deceleration of 6m/sec^2. There are brakes on all four wheels. The tyre diameter is 800 mm. The K.E. of rotating parts is 15% of K.E. of moving vehicle. The mass of each brake drum assembly is 13 kg and specific heat capacity is 470 J/kg°C. Calculate following : **[12]**

i) braking time

ii) braking distance.

iii) total capacity of each brake.

iv) total energy absorbed by each brake and

v) temp. rise of brake drum assembly.

Unit-III

Q5) a) State and explain four basic-modes of failure in roller chain. **[3]**

b) Explain stresses in wire rope with sketch. **[3]**

c) A fan is driven by an open belt drive from 35 kW, 1000 rpm electric motor. Fan pulley diameter is 950 mm. While the motor shaft pulley diameter is 300 mm. Centre distance between shaft is 2.25 m. Coefficient of friction between the belt and pulley is 0.25 and allowable tensile stress in the belt is limited to 3 MPa. Density of belt material is 950 kg/m^3 and belt width is 100 mm. Calculate : **[10]**

i) Belt thickness

ii) Belt length.

iii) Initial tension.

OR

Q6) a) Derive the condition for maximum power capacity of belt. **[4]**

b) Explain polygonal effect in chain with sketch. **[5]**

c) Draw neat sketch of rope drum construction and explain its design procedure. **[7]**

SECTION - II

Unit-IV

Q7) A spur gear pinion having 20 teeth to be made of plain carbon steel 40C8 with Sut = 580 N/mm^2. is to mesh with gear having 85 teeth made of gray cast iron FG 260. Pinion shaft is connected to 15 kW. 1440 rpm electric motor. Starting torque is twice rated torque. Tooth system is 20° full-depth involute. Face width is 12 times module for which load distribution factor is 1.4. Gears are machined to meet specifications of grade 7; for which deformation factor is 11500 e. **[16]**

a) If factor of safety against bending is 1.5, design gear pair by using velocity factor & Buckingham's equation for dynamic load.

b) If factor of safety against pitting is 2.0 specify hardness.

Take

Velocity factor $C_v = \frac{6}{6+v}$

Lewis form factor $\gamma = 0.484 - \frac{2.87}{Z}$

Z = No. of teeth.

For grade 7.

tooth error $e = 11 + 0.9(m+0.25\sqrt{d})$

Dynamic load $Pd = \frac{21V(bc + Pt\max)}{21V + \sqrt{bc + Pt\max}}$ N.

std. modules :- 1, 1.25, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 8.0, 10.

OR

Q8) a) Write note on gear lubrication. **[4]**

b) A pair of spur gears with 20° full depth involute teeth system consist of pinion with 21 teeth running at 720 rpm meshing with gear running at 378 rpm. Pinion is made of alloy steel with Sut = 700 N/mm^2 and gear with plain carbon steel having Sut = 580 N/mm^2. Gear pair is heat treated to 400 BHN. Face width is 10 times module. Service factor and factor of safety are 1.25 and 1.75 respectively. Gear pair is manufactured by hobbing

process. Centre distance between pinion & gear shaft is 152.5 mm. Assuming velocity factor accounts for dynamic load calculate. **[12]**

i) Beam strength

ii) Wear strength

iii) Maximum static load that gear pair can transmit.

iv) Rated power that gear pair transmit. Take velocity factor $C_v = \frac{6}{6+v}$.

Unit-V

Q9) A Helical gear having 21 teeth to be made of plain carbon steel 55C8 with ultimate tensile strength 720 N/mm^2 is to mesh with gear made of plain carbon steel 40C8 with ultimate tensile strength 580 N/mm^2. Gear pair is required to transmit 10 kW from electric motor running at 1000 rpm to m/c running at 300 rpm. starting torque is 125% of rated torque. Factor of safety is 1.25. Face width is 10 times normal module. Tooth system is 20° full-depth involute. Helix angle is 25°. Gears are machined to meet specification of grade 6. Gear & pinion are case hardened to 300 and 350 BHN respectively. Design gear pair by using velocity factor and Buckingham's equation for dynamic load. **[16]**

Take,

Velocity factor $C_v = \frac{5.6}{5.6+\sqrt{v}}$

Deformation factor C = 11500e.

Lewis form factor $\gamma' = 0.484 - \frac{2.87}{Z'}$

load stress factor $K = 0.16 \left[\frac{BHN}{100}\right]^2$

For grade 6 :

$$e = 8 + 0.63\left[mn + 0.25\sqrt{d}\right]$$

OR

Q10)a) A pair of straight bevel gears with pressure angle 20°, consist of 20 teeth pinion meshing with 30 teeth gear. The module is 4mm, while face width is 20 mm. The material for pinion and gear is steel 50 C4 (Sut = 750 N/mm^2). The gear teeth are lapped and ground to meet specification of grade three and surface hardness is 400 BHN. Pinion rotates at 500 rpm and receives 2.5 kW from electric motor. The starting torque of motor is 150% of rated torque. Determine factor of safety against bending and pitting failure. **[11]**

Take for grade 3;

$$e = 2 + 0.16\left[m + 0.25\sqrt{dm}\right]$$

Where dm = mean diameter.

$$\text{Dynamic load } (p_d) = \frac{21v\left(bc + ptmax\right)}{21v + \sqrt{bc + Ptmax.}}$$

Where

deformation factor (C) = 11500e.

Ptmax = Max. tangential load.

b) With neat sketch explain components of forces acting on straight bevel gear. **[5]**

Unit-VI

Q11)a) Derive equation for efficiency of worm gear in terms of lead angle and virtual friction angle. **[6]**

b) A pair of worm and worm gear is designated as 1/30/10/10. The input speed of worm is 1200 rpm. The worm wheel is centrifugally cast and made from phospher bronze having ultimate strength 240 N /mm^2. Coefficient of friction between worm & worm teeth is 0.04. Application factor & factor of safety are 1.25 & 1.5 respectively. The tooth system is 20° full depth involute. Calculate power transmitting capacity based on beam strength. **[12]**

OR

Q12)a) A worm down type 2/40/10/5 worm gear pair transmit 5 kW power from worm shaft rotating at 1440 rpm to worm gear shaft. The worm is left hand and rotates in anticlockwise direction, when viewed from right side. Coefficient of friction between worm & worm gear teeth is 0.05. While normal pressure angle is 20°. Determine **[12]**

i) Components of forces acting on worm & worm gear and show their directions.

ii) Efficiency of worm gear pair.

iii) Power lost in friction.

Use:- Lewis form factor $\gamma = 0.484 - \frac{2.87}{zg}, C_v = \frac{6}{6 + Vg}$

b) Write note on 'Thermal considerations in worm gear design.' **[6]**

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Total No. of Questions : 12]

SEAT No. : ____

P967

[Total No. of Pages : 3

[4163] - 18
T.E. (Mech.)
FLUID MACHINERY
(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions :-

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A rectangular plate weighing 40N is suspended vertically by a hinge on the top horizontal edge. The height of plate is 80 cm. A horizontal jet of water 20 mm in diameter strikes the plate normally at a distance of 600 mm below the hinge with a velocity of 6 m/s. Find horizontal force applied at the lower edge of the plate to keep it vertical.

If the plate is free to swing in the direction of jet, find the angle through which it will swing from its vertical position. **[10]**

b) State and Explain impulse-momentum principle. **[6]**

OR

Q2) a) A jet has a impact on series of flat plates mounted on a wheel. Find force acting on the plate and efficiency. **[6]**

b) A jet with a velocity of 40m/s strikes a blade moving with a velocity of 90 m/s. The jet makes an angle of 25° with the direction of motion of the blade at inlet and leaves at angle of 115° to direction of motion of the blade at outlet. Find the blade angles at inlet & outlet so that water enters and / eaves the blade without shock. **[10]**

Q3) a) Explain construction and working of pelton wheel. **[8]**

P.T.O.

b) A pelton wheel works under a head of 210m. & runs at 350rpm. The over all efficiency is 83% and jet ratio is 12. Find **[8]**

i) Wheel dia.

ii) No. of buckets

iii) Specific speed.

OR

Q4) a) Compare impulse & reaction turbine. **[8]**

b) A pelton wheel develops 4500 kW under a head of 125m, at a speed of 200 rpm. Take Cv = 0.98 speed ratio = 0.46, efficiency = 88% & jet ratio = 9, Find **[8]**

i) Flow required

ii) Specific speed

iii) No. of jets.

Q5) a) Explain the construction & working of a kaplan turbine. **[8]**

b) A kaplan turbine produces a power of 10,000 kW under a head of 12m. Take speed ratio = 2, flow ratio = 0.65 Diameter of hub = 0.3 times External diameter of vane. Over all efficiency = 94%. Find speed & diameter of machine. **[10]**

OR

Q6) a) Explain different efficiencies of turbine. **[8]**

b) A reaction turbine works at 450rpm under a head of 115m. The diameter of inlet is 1.2 m and flow area is 0.4 m^2. At the inlet the absolute & relative velocities make angle of 20° & 60° respectively with tangential velocity. **[10]**

Find:

i) Runner power ii) Hydraulic efficiency.

Assume velocity of whirl at outlet to be zero.

SECTION - II

Q7) a) A test model of 1/4 size is prepared to carry out the test for an actual machine which develops 14 MW power when head is 48m and it has to run at 300 rpm. The head available in laboratory is 12m. Determine speed, power & flow rate passing through the model. Take $\eta_u = 0.8$ for model & prototype. **[10]**

b) Explain with a neat sketch the working of reaction turbine. **[8]**

OR

Q8) a) Explain various unit quantities. **[8]**

b) The model of a turbine begins to cavitate when NPSH falls below 2.4 metres while it operates under the head of 7.5 metres. What is required suction height of actual turbine operating under head of 26 metres so that there is no cavitation. **[10]**

Q9) a) Derive the Expression for specific speed of Centrifugal pump. **[8]**

b) A centrifugal pump with manometric efficiency of 0.8 operates against manometric head of 32 m. Take radial velocity of flow to be constant and increase in the pressure through the impeller is 65% of total head developed by the pump. Find **[8]**

i) Speed of pump

ii) Discharge

iii) Input power.

Take impeller diameter as 150 mm & width as 15mm. The blade angle at Exit is 60°.

OR

Q10)a) Derive fundamental equation of centrifugal pump. **[8]**

b) Impeller of centrifugal pump rotating at 1500 rpm has an outer diameter of 400mm. Determine head generated if blade angle is 25° & velocity of flow through the impeller is 3m/s which is constant. Take hydraulic efficiency as 78%. Find power input to pump if width at Exit of impeller is 100 mm. **[8]**

Q11)a) Explain the functions of air vessel used in reciprocating pump. **[8]**

b) A reciprocating pump sucks water from 2.5m deep and delivers at 42m when running at 50rpm. The diameter and strokes of piston are 18 cm & 36cm respectively. Find power required to drive pump if mechanical efficiency is 85%. **[8]**

OR

Q12)a) Explain working of hydraulic ram. **[8]**

b) Find efficiencies of hydraulic ram for the following data. Supply head = 4m. Delivery head = 24m. Discharge of ram = 0.10m^3/min. Flow rate to ram = 1.2 m^3/min. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P968

[Total No. of Pages : 4

[4163] - 19
T.E. (Mechanical)
REFRIGERATION & AIR CONDITIONING
(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit-I

Q1) a) Write a note on steam jet refrigeration. **[6]**

b) Derive an expression for cop of Bell- column cycle. **[6]**

c) A reversed carnot cycle device device works between 10°C and 35°C. Calculate cop of the device as a **[4]**

i) refrigerator ii) heat pump

OR

Q2) a) Explain with a neat sketch and T-Sdiagram : Boot - Strap system. **[9]**

b) Define : EFR, IPLV **[3]**

c) What are the advantages and disadvantages of air refrigeration? **[4]**

Unit-II

Q3) a) Explain effect of **[8]**

i) increase in evaporator pressure

ii) increase in condenser pressure on performance of VCR Cycle.

b) How refrigerants are classified? **[3]**

c) Write a note on 'Desirable properties of refrigerants.' **[5]**

OR

P.T.O.

Q4) a) Explain : ODP, GWP, TEWI. **[9]**

b) Twenty eight tonnes of ice from and at 0°C is produced per day in an ammonia refrigeration plant. The evaporator temperature is –15°C and condenser temperature is 25°C. The refrigerant is dry & saturated at the end of compression. If the actual cop is 60% of the theoretical cop, calculate the power required to drive the compressor.

Assume latent heat of fusion of ice = 335 kJ/kg. Use properties of ammonia as given below. **[7]**

Temperature (°C)	h_f (kJ/kg)	h_g (kJ/kg)	s_f (kJ/kgK)	s_g (kJ/kgK)
25	100.04	1319.22	0.3473	4.4852
–15	–54.56	1304.99	–2.1338	5.0585

Unit-III

Q5) a) Explain cascade refrigeration system with a neat sketch and p-h diagram. **[8]**

b) Compare : VAR and VCR **[4]**

c) Explain 'Electrolux Refrigeration System' with a neat sketch. **[6]**

OR

Q6) a) Derive an expression for cop of an ideal vapour absorption system. **[6]**

b) What is a multipressure system? Explain two stage compression system with flash gas removal. **[6]**

c) Explain with a neat sketch LiBr-H_2O absorption refrigeration system. **[6]**

SECTION - II

Unit-IV

Q7) a) Define the following. **[6]**

i) Humidity ratio

ii) Relative humidity

iii) Wet bulb depression and Dew point depression.

b) What is efficiency of coil? List parameters on which efficiency of coil depends. **[4]**

c) The humidity ratio of atmospheric air at 28°C DBT and pressure 1.013 bar is 0.016 kg/kg of dry air. **[6]**

Determine :

i) Relative humidity

ii) Dew point temperature

iii) Vapour density

OR

Q8) a) Explain how various psychrometric processes can be achieved by controlling the temperature of spray water in Air washer. **[6]**

b) What is effective temperature? What factors affect effective temperature. **[4]**

c) 800 m^3/min of recirculated air at 22°C DBT and 10°C DPT is to be mixed with 300m^3/min of fresh air at 30°C DBT and 50% RH. **[6]**

Determine :

i) Humidity ratio

ii) Dew point temperature

iii) Enthalpy of the mixture

Q9) a) Explain the working of thermo static expansion valve with the help of neat sketch. **[6]**

b) What is humidistat? Explain working of any one humidistat with neat sketch. **[6]**

c) What is infiltration and ventilation load? **[4]**

OR

Q10)a) Define RSHF. How RSHF line is drawn on the Psychrometric chart? **[6]**

b) Explain Unitary and central air-conditioning systems. **[6]**

c) Define : **[4]**

i) ADP

ii) GSHF.

Q11)a) What do you understand by static and velocity pressure in a duct? **[4]**

b) Enumerate the design considerations of ducts for an air-conditioning system. What are the desirable properties of an ideal duct materials. **[8]**

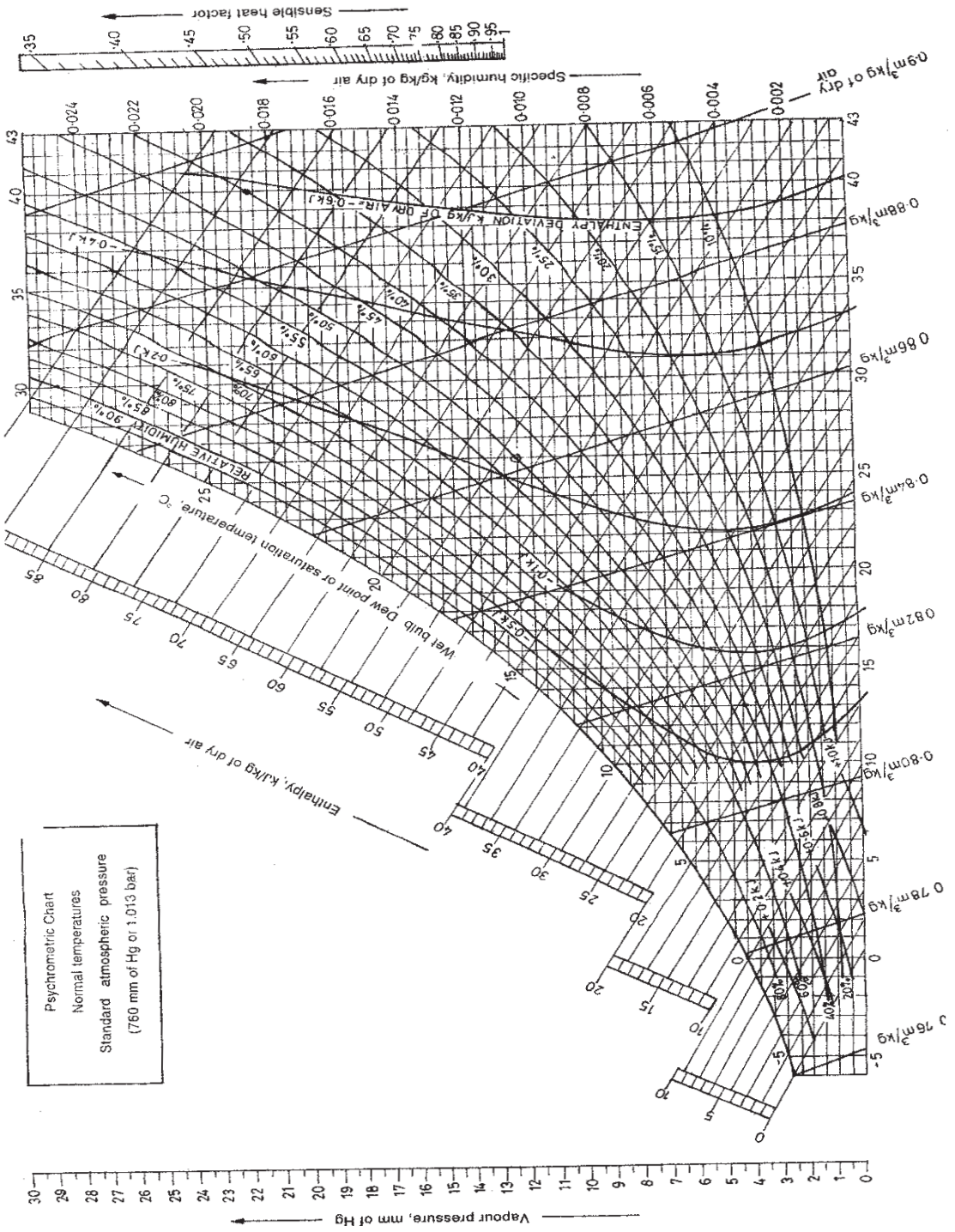
c) Explain static regain method of duct design giving it's advantages and disadvantages. **[6]**

OR

Q12)a) Explain the different methods of food preservation. **[6]**

b) What is friction chart? Discuss it's use in duct sizing. **[6]**

c) Write a short note on cold storage. **[6]**


Psychrometric Chart
Normal temperatures
Standard atmospheric pressure
(760 mm of Hg or 1.013 bar)
Enthalpy, kJ/kg of dry air
Wet bulb Dew point or saturation temperature, °C
Vapour pressure, mm of Hg
Specific humidity, kg/kg of dry air
Sensible heat factor
RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ/kg OF DRY AIR
0·9m³/kg of dry air
0·88m³/kg
0·86m³/kg
0·84m³/kg
0·82m³/kg
0·80m³/kg
0·78m³/kg
0·76m³/kg

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Total No. of Questions : 12]

SEAT No. :

P1574

[Total No. of Pages : 4

[4163] - 40

T.E. (Production) (Common with Prod. S/W)

DATABASE AND INFORMATION TECHNOLOGY FOR PRODUCTION ENGINEERING

(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any one question from each unit.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) What are the advantages and limitations of database processing? **[5]**

b) What are the drawbacks of conventional file processing system? **[5]**

c) Draw and explain the three layered DBMS architecture. **[6]**

OR

Q2) Explain the following : **[16]**

a) Data types used in SQL.

b) Relational database management system.

c) Entities and their attributes.

d) Hierarchical model.

Unit - II

Q3) a) Explain the following : **[6]**

i) Modifying the structure of tables.

ii) Grouping data from tables in SQL.

P.T.O.

b) Write a SQL query to create a table 'sales_order' with the following columns.

i) Primary Key as a column constraint. **[3]**

ii) Primary Kay as a table constraint. **[4]**

Column Name	Data Type	Size	Attributes
S_order_no	Varchar2	6	Primary Key
Product_no	Varchar2	6	Primary Key
Qty_ordered	Number	8	-
Qty_disp	Number	8	-
Product_rate	Number	8,2	-

c) Write correct SQL syntax to add a new column 'salesman_no' with suitable data type and size to the sales_order table? **[3]**

OR

Q4) a) Explain the use of logical operators AND, OR, NOT in SQL programming with an example? **[8]**

b) i) Create a table 'client_master' with following columns by assuming suitable data type and size with correct syntax?
client_no, name, address, city, state, pincode. **[4]**

ii) Insert any three records of your choice using INSERT command **[4]**

Unit - III

Q5) a) Define mathematical modeling. Explain the importance of mathematical modeling in engineering applications? **[8]**

b) Draw a flow chart and pseudo C-programming code to evaluate the sine of *x*, which can be calculated approximately by summing the first '*n*' terms of the infinite series. **[10]**

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + - - - - - - - -$$

where *x* is expressed in radians (Note : Π radians = 180°).

OR

Q6) a) Explain the following : **[8]**

i) Principles of good programming

ii) Types of errors in programming

b) What is a computer network? What are the characteristics of local area networks? Explain in brief various types of transmission media. **[10]**

SECTION - II
Unit - IV

Q7) a) Write a C program that reverses the digits of a given positive integer say 1234 using a *for* loop **[8]**

b) Write a *do-while* statement in C to print the following sequence of integers : **[3]**

–4, –2, 0, 1, 2.

c) Evaluate $\sqrt{12}$ to four decimal places by Newton-Raphson method. **[7]**

OR

Q8) a) Describe the output generated by the following program. **[7]**

```
# include <stdio.h>
main( )
{
  int i = 0, x = 0;
  for (i = 0; i<10; ++ i)
    {
            if (i %  2 = = 1)
                x + = i;
       else
                x--;
       printf ("%d",x);
       continue;
    }
  printf("/ n x = %d",x);
}
```

b) Change the following *for* loop to *while* loop **[3]**

```
# include <stdio.h>
      main( )
      {
           int m;
           for (m = 1; m<10; m=m+ 1)
                printf("%d", m);
      }
```

c) Solve the following system of equations by Gauss-Seidal method correct to four decimal places. **[8]**

$2x + 17y + 4z = 35$

$28x + 4y – z = 32$

$x + 3y + 10z = 24$

Unit - V

Q9) a) Define absolute error, relative error and round off error with an example for each. **[6]**

b) Consider the following 3 × 3 matrix A **[10]**

$$A = \begin{bmatrix} 1 & \frac{1}{2} & \frac{1}{3} \\ \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \end{bmatrix}$$

Find the inverse of this matrix using two and four significant figures of 1/3. Comment on the elements of A^{-1} in terms of error analysis.

OR

Q10)a) Fit a straight line to the following data using the method of least squares: **[8]**

x :	71	68	73	69	67	65	66	67
y :	69	72	70	70	68	67	68	64

b) Using Lagrange's interpolation formula, find y (10) from the following table : **[8]**

x :	5	6	9	11
y :	12	13	14	16

Unit - VI

Q11)Explain the following in brief : **[16]**

a) Data warehousing

b) Capabilities of information systems

c) Electronic data interchange

d) Electronic fund transfer

OR

Q12)a) Define the term 'expert system'? What are the benefits of expert system? Explain with a neat line diagram the terms involved in expert system organization? **[10]**

b) What is a computer-based information system? Explain its components. **[6]**

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Total No. of Questions : 12]

SEAT No. :

P1375

[Total No. of Pages : 3

[4163] - 45

T.E. (Electrical Engineering)

MANAGEMENT TECHNIQUES

(2003 Pattern) (Sem.-I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any one question from each unit.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) What are the different forms of business organizations? Discuss in detail the formation, advantages and disadvantages of following types of business organizations. **[16]**

a) Partnership

b) Joint stock enterprises.

OR

Q2) a) Discuss the following with an example : **[8]**

i) Management

ii) Administration

iii) Organization

b) 'All managers by whatever name called manage'. Discuss, bringing out the universality of management functions. **[8]**

P.T.O.

Unit - II

Q3) a) Distinguish between the following : **[10]**

i) Invited bids and Speculative bids

ii) Principal and Promoter

b) Define plant layout? Describe with a neat diagram the process and cellular layout? **[8]**

OR

Q4) a) Explain the importance of plant location? Describe the various factors to be considered in selecting the actual site in a particular locality? **[10]**

b) What is materials management? Explain the importance of materials management in manufacturing industry? **[8]**

Unit - III

Q5) Discuss in detail the main provisions of following acts: **[16]**

a) Workmen compensation act

b) Minimum wages act

OR

Q6) a) What is performance appraisal? Explain its significance? **[8]**

b) Define 'Motivation'. Explain the classification of hierarchy of needs as given by Maslow? **[8]**

SECTION - II

Unit - IV

Q7) a) Explain the scope and objectives of financial management? **[8]**

b) What are the functions of finance? Explain in detail? **[10]**

OR

Q8) a) What are the various elements of primary cost? Explain it by suitable examples? **[6]**

b) Distinguish between the following : **[6]**

i) Prime cost and Factory cost

ii) Marketing and Selling

c) Explain the financial institutions in nation building? **[6]**

Unit - V

Q9) a) Describe the seven sources of manufacturing wastes as identified in the JIT system? **[8]**

b) Define Total Quality Management (TQM)? State and explain the guiding principles of Total Quality Management? **[8]**

OR

Q10)a) Why is an ISO - 9000 certification important to a firm? Explain the methodology of ISO - 9000 certification? **[10]**

b) Explain the role of Kanban cards in JIT manufacturing? **[6]**

Unit - VI

Q11)a) What is 'self development'? Explain in brief different methods of self development? **[8]**

b) Explain the following : **[8]**

i) Time management

ii) Business and Professional ethics

OR

Q12)Define 'Communication? Explain the process of communication with a neat line diagram? What are the advantages and disadvantages of Verbal and Nonverbal communication? **[16]**

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Total No. of Questions : 12]

SEAT No. :

P987

[Total No. of Pages : 2

[4163] - 55
T.E. (Electronics /E & TC)
MECHATRONICS
(2003 Patterm) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer question Q.1 or Q.2, Q3 or Q.4, Q5 or Q.6 from section I & Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) Define Mechatronics. What is scope and importance of Mechatronics? Explain the different stages of the design process of Mechatronics system. **[10]**

b) Define Modern Automatic camera, giving information of basic elements of control systems used in this camera. **[8]**

OR

Q2) a) Define robotics. What are different types of robots? Explain any one type in detail. **[8]**

b) Explain the following terms related to measurement system. Accuracy, precision, Drift, sensitivity, Linearity. **[10]**

Q3) a) Explain construction and working of LVDT. **[8]**

b) List any four sensors used for pressure measurement. Compare their different characteristics. **[8]**

OR

Q4) a) Explain with the help of Wheatstone bridge arrangement, how output voltage is calibrated in terms of force in case of cantilever beam load cell. **[8]**

b) Enlist different specifications of a temperature transducer for selecting it for typical application. Explain fiber optic temperature transducer. **[8]**

P.T.O.

Q5) a) Define PLC and state features of PLC. Explain architecture of PLC with block diagram. **[8]**

b) Explain the two PIC microcontrollers of typical manufacturers along with input and output interfaces for these microcontrollers. **[8]**

OR

Q6) a) Explain how instrumentation amplifier using Op-Amp's can be used as building blocks of signal conditioning. List important features of AD 522. **[8]**

b) Give the need for ADC in instrumentation system. State and explain different ADC selection factors. **[8]**

SECTION - II

Q7) a) Draw the block diagram of magnetic tape recording and reproducing system. Explain its working. **[8]**

b) With a neat block diagram explain Data logger and its functions. Briefly explain the function of each block. **[8]**

OR

Q8) a) With necessary timing diagram explain the communication procedure in I^2C bus. **[8]**

b) Enlist different components of a Data acquisition system. With neat diagram explain multichannel DAS. Give typical applications of DAS. **[8]**

Q9) a) Explain the major functions of an actuator. With neat diagrams explain **[8]**

i) Single acting cylinders. ii) Double acting cylinders.

b) Explain the important specifications and selection criteria of stepper motor. **[8]**

OR

Q10) a) What is electrical actuator? Explain role of solenoids and relays as actuators. **[8]**

b) Explain the following types of cables: **[8]**

i) Co axial cables. ii) Fiber optic cables.

Q11) Explain with block schematic, and necessary circuit diagram working of LVDT based weighing machine to weigh 20 kg with resolution of 10 grams. **[18]**

OR

Q12) Explain with neat block schematic pick and place robot with actuators and sensors. Give reasons for selection of these components. **[18]**

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Total No. of Questions : 12]

SEAT No. :

P1577

[Total No. of Pages : 2

[4163] - 71

T.E. (Printing)

PRINTING NETWORK AND COMPUTER GRAPHICS

(2003 Pattern) (sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain DOS with the help of following points. **[16]**

a) Features.

b) DOS structures.

c) Boot up sequence.

d) Internal and external DOS commands with sequence.

OR

Q2) a) Explain UNIX operating system. **[8]**

b) Explain the features of WINDOWS operating system. Differentiate between DOS and WINDOWS operating system. **[8]**

Q3) a) Classify and Explain different network types. **[10]**

b) What is role of internet in printing industry? **[8]**

OR

Q4) a) Explain the OSI reference model. **[10]**

b) Explain the IP Protocol in detail **[8]**

P.T.O.

Q5) a) Explain the basic graphics system. **[8]**

b) Explain the TIFF file format. **[8]**

OR

Q6) a) Explain the Video RAM. **[8]**

b) Explain the fundamental steps involved in Image Processing. **[8]**

SECTION - II

Q7) a) What is internetworking? Explain different internetworking devices. **[8]**

b) Explain VSAT and its application in Printing field. **[8]**

OR

Q8) a) What is ISDN? State different services offered by ISDN. Explain any one service in detail. **[8]**

b) Explain Video conferencing in detail. **[8]**

Q9) a) What is workflow? Explain the features of workflow system? Explain the application of workflow system in newspaper industry? **[10]**

b) Explain the integration of prepress-press-postpress. **[8]**

OR

Q10)a) What is DBMS ? What are the applications of DBMS in Printing Industry. Explain the three level architecture of DBMS. **[10]**

b) Explain PDF Workflow system. **[8]**

Q11) What are input devices? Explain different input devices and its application in printing. **[16]**

OR

Q12) What are output devices? Explain different output devices and its application in Printing. **[16]**

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Total No. of Questions : 12]

SEAT No. :

P1578

[Total No. of Pages : 2

[4163] - 76

T.E. (Printing)

PRINTING TELECTRONICS AND OPTOELECTRONICS

(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain different data transfer techniques. **[8]**

b) Explain basic problems of long distance transmission. **[8]**

OR

Q2) a) Explain various data networks. **[8]**

b) Explain data transfer using satellite network. **[8]**

Q3) a) What is modulation? Explain pulse position modulation with suitable diagram. **[8]**

b) What is multiplexing? Explain time division multiplexing with block diagram. **[8]**

OR

Q4) a) What is quantization? Explain uniform & non uniform quantization. **[8]**

b) Explain companding with 'A' Law and 'μ' Law with suitable diagram. **[8]**

Q5) a) What are various types transmission channels? What is channel capacity? **[8]**

b) Explain different types of noise. **[10]**

OR

P.T.O.

Q6) Write short notes on : (Any three) **[18]**

a) Data Transfer using E-mail.

b) Image grabbing and transfer.

c) Tele text

d) Videotex

e) Noise interference and remedies.

SECTION - II

Q7) a) What are different types of light sources. Explain LED. **[8]**

b) Explain Laser printer application. **[8]**

OR

Q8) a) Explain sheet thickness measurement with magnetic and optical sensors. **[8]**

b) What are different photo detectors? Explain characteristic of photo-diode. **[8]**

Q9) a) Explain the construction and working of fiber optic cable. **[8]**

b) Explain the different losses in fiber. **[8]**

OR

Q10)a) Explain with block diagram basic fiber optic communication system. **[8]**

b) Derive the expression for numerical aperture of optical fiber. **[8]**

Q11)a) Explain plate making application using Laser. **[10]**

b) What RF ID? Explain with one application. **[8]**

OR

Q12)a) Explain WI-Fi technology. **[10]**

b) Explain smart ticket application of RFID. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P1579

[Total No. of Pages : 3

[4163] - 77

T.E. (Printing)

SURFACE PREPARATION I

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***All questions are compulsory.***
2) ***Assume suitable data, if necessary.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the following points to be considered while planning the job. **[8]**

i) Size of the machine

ii) Size of the plate

iii) Size of the book

iv) Quantity to be printed

b) Explain the method of preparing the layout for any job to be printed with suitable diagrams. **[8]**

OR

a) Draw the eight page imposition scheme with sheet work method and label the elements. **[8]**

b) Draw the eight page imposition scheme with half sheet work method and label the elements. **[8]**

Q2) a) List down the steps of preparing Water Deep etch plate in proper sequence. **[8]**

b) Differentiate between Positive and Negative Pre Sensitized plate. **[8]**

OR

P.T.O.

a) List down the steps of preparing Gum Deep etch plate in proper sequence. **[8]**

b) Explain why Positive PS plates are called as Subtractive and Negative PS plates as Additive plates? **[8]**

Q3) a) Explain the Driographic printing process with suitable diagram. **[9]**

b) Explain the method of preparing the Toray plate. **[9]**

OR

a) Explain the method of preparing the Rubber plates used in Flexography. **[9]**

b) Explain Water soluble photopolymer resin plate making. **[9]**

SECTION - II

Q4) a) Explain the Polyester master computer to plate technology in detail. **[8]**

b) Explain the use of Ctp in News paper industry. **[8]**

OR

a) What are the selection criterias of laser while designing the laser plate making system. **[8]**

b) Suggest suitable Ctp technology for the commercial printing firm with proper justification. **[8]**

Q5) a) Explain various terminologies associated with the screen mesh. **[8]**

b) Differentiate between Direct and Indirect method of preparing the screen. **[8]**

OR

a) Explain any one method of preparing the screen in detail with diagrams. **[8]**

b) Explain in detail the application of each screen making method. **[8]**

Q6) a) Explain various elements of the colour control bar. **[9]**

b) Find out the number of plates required to print the following job : Magazine. **[9]**

Text pages : B/W : 96

Cover page : Four colour : 04

Size of the magazine : A4

Size of the machine : 20" × 30"

Quantity to be printed : 3000.

OR

a) Explain various environmental considerations to be observed in the plate making department. **[9]**

b) Find out the number of plates required to print the following job : Magazine. **[9]**

Text pages : Two colour : 64

Cover page : Four colour : 04

Size of the magazine : A4

Size of the machine : 18" × 23"

Quantity to be printed : 1000.

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Total No. of Questions : 8]

SEAT No. :

P1701

[Total No. of Pages : 2

[4163] - 106
T.E. (Petrochemical Engineering)
UNIT PROCESSES IN ORGANIC SYNTHESIS
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe with flowsheet the process for conversion of ethyl benzene to styrene. **[12]**

b) Describe the process for photochlorination of cyclohexane. **[6]**

Q2) a) Describe with flowsheet the process for conversion of methanol to formaldehyde. **[12]**

b) Write a note on Schmidt nitrator. **[4]**

Q3) a) Describe with flowsheet the continuous process for preparation of ethyl acetate. **[12]**

b) Write a note on Bechamp reduction. **[4]**

Q4) a) Describe with flowsheet the catalytic vapour phase reduction process for conversion of nitrobenzene to aniline. **[12]**

b) Explain the methods used for working up of sulfonation process. **[4]**

P.T.O.

SECTION - II

Q5) a) Describe with flowsheet the process for conversion of benzene to dodecyl benzene. **[12]**

b) Write a note on agents used for alkylation. **[6]**

Q6) a) Describe the continuous ammonolysis process for conversion of chlorobenzene to aniline. **[10]**

b) Mention the types of oxidative processes with examples. **[6]**

Q7) a) Describe with flowsheet the liquid phase oxidation process for conversion of acetaldehyde to acetic acid. **[10]**

b) Write a note on catalysts used for hydrogenation. **[6]**

Q8) a) Describe with flowsheet any one process to manufacture vinyl chloride monomer. **[10]**

b) Explain DVS with significance. **[6]**

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Total No. of Questions : 12]

SEAT No. :

P1703

[Total No. of Pages : 2

[4163] - 116
T.E. (Polymer Engineering)
POLYMER CHEMISTRY - II
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***All questions are Compulsory.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss the thermodynamics of polymer dissolution. **[8]**

b) What is polymer degradation? Explain various types of degradation. **[9]**

OR

Q2) Write a note on :

a) Size and shape of macromolecules in solution. **[8]**

b) Polymer dissolution process. **[9]**

Q3) a) Discuss various types of isomerism in polymers. **[8]**

b) Write a note on coordination polymerization. **[9]**

OR

Q4) a) Explain how ZN polymerization mechanism works. **[8]**

b) Write a note on zirconocene catalyst. Explain its working mechanism. **[9]**

Q5) a) What is copolymerization? Explain synthesis of block copolymers. **[8]**

b) Discuss various types of copolymerization behavior. **[8]**

OR

Q6) a) Give the features of anionic copolymerization. **[8]**

b) With suitable examples explain how copolymerization add to the properties as compared to their homopolymers. **[8]**

P.T.O.

SECTION - II

Q7) a) Explain the synthesis of resol in detail. **[8]**

b) Give the properties and applications of epoxy resin. **[9]**

OR

Q8) Explain the synthesis, crosslinking and formulations of following.

a) Silicone resins **[8]**

b) UPE resins **[9]**

Q9) Discuss the following polymer reactions and give at least one application of each of them.

a) Addition reaction **[8]**

b) Aminolysis **[9]**

OR

Q10) Explain in detail the following reactions and their commercial uses.

a) Hydroxyl group reactions **[8]**

b) Vulcanization **[9]**

Q11) a) Derive the kinetic expression for cationic polymerization. **[8]**

b) Explain the kinetics of free radical chain polymerization. **[8]**

OR

Q12) a) Differentiate between the kinetics of homo and copolymerization. **[8]**

b) Discuss the kinetic equation for acid catalyzed polycondensation. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1021

[Total No. of Pages : 3

[4163] - 123
T.E. (ComputerEngineering)
MICROPROCESSORS AND MICROCONTROLLERS
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***In Section - I attempt : Q. No.1 or Q. No.2, Q. No.3 or Q. No.4 , Q. No.5 or Q. No.6. In Section - II attempt : Q. No.7 or Q. No.8, Q. No.9 or Q. No.10, Q. No.11 or Q. No.12.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With the help of block diagram, explain the architecture of Pentium Processor. **[8]**

b) Describe the pipelining stages in integer units of Pentium. **[8]**

OR

Q2) a) Describe the cache organization in details for code and data cache. **[8]**

b) Discuss the RISC features in Pentium. **[8]**

Q3) a) Draw and explain pipelined write cycle of Pentium. **[8]**

b) What is the BIST? When does Pentium enter it ? Mention other modes which Pentium may enter when reset. **[8]**

OR

Q4) a) With the help of neat block diagram explain 32 bit memory interfacing with Pentium. **[8]**

b) Describe different data types used with Pentium. **[4]**

c) Explain any two protected mode instructions. **[4]**

P.T.O.

Q5) a) Explain the process of linear to physical address translation for 4KB pages. Also name and draw the formats of descriptors and registers used for translation. **[8]**

b) What is TLB? How it is useful in paging? **[4]**

c) What are page directories and page tables? What are their sizes? **[6]**

OR

Q6) a) What are system descriptors in Pentium? Name them and also describe their use in protected mode of Pentium. **[6]**

b) What is CPL, DPL, RPL? State the range of values for the same. **[4]**

c) What is GDT? How it is useful in logical to linear address translation in Pentium? Explain with the help neat diagram. **[8]**

SECTION - II

Q7) a) What do you mean by Task? Explain the process of Task Switching in Pentium. **[8]**

b) Explain I/O Permission Bit Map. **[4]**

c) What are the different classes of Exception? **[4]**

OR

Q8) a) What is TSS? What are the contents of It? Explain its use in Multitasking. **[8]**

b) Explain Virtual Mode of Pentium Processor. **[4]**

c) Describe Nested Tasks of Pentium Processor. **[4]**

Q9) a) Draw and Explain Architecture of 8051 Microcontroller in detail. **[10]**

b) Explain Memory organization of 8051 Microcontroller. **[8]**

OR

Q10)a) What are the different addressing modes of 8051 Microcontroller? Explain with the help of suitable examples. **[10]**

b) Explain Timer structure in 8051 Microcontroller and SFR's used in Timer programming. **[8]**

Q11)a) Describe Power on Reset of PIC 16C61/71. **[6]**

b) Describe the features of PIC 16C61/71. **[6]**

c) Explain the following instructions: **[4]**

i) DECFSZ

ii) BTFSC

OR

Q12)a) Explain the significance of Watchdog Timer in PIC Microcontroller. **[8]**

b) Draw and Explain Architecture of PIC 16C61 /71 Microcontroller. **[8]**

■■■

Total No. of Questions : 12]

SEAT No. :

P1025

[Total No. of Pages : 3

[4163] - 128
T.E. (Computer Engineering)
MANAGEMENT INFORMATION SYSTEMS
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Figures to the right indicate full marks.***
3) ***From Section I, Answer (Q.1 or Q.2) and (Q.3 or Q.4) and (Q.5 or Q.6).***
4) ***From Section II, Answer (Q.7 or Q.8), (Q.9 or Q.10) and (Q.11 or Q.12).***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Make suitable assumptions wherever appropriate and relevant.***

SECTION - I

Q1) a) What is information system? Explain the various types of information systems with suitable examples. **[9]**

b) Define Management. Explain the various levels of management. **[8]**

OR

Q2) a) Management Information System (MIS) supports a manager in his functional responsibilities. Explain. **[9]**

b) What is corporate planning? Explain the essentiality of strategic planning. **[8]**

Q3) a) What is Human Resource Management (HRM) ? Why HRM is considered important element in Information Technology (IT). **[9]**

b) Differentiate between service and product. What is distinctive service? **[8]**

OR

Q4) a) Explain the applications of Management Information Systems (MIS) in: **[9]**

i) Banking sector

ii) Marketing management

b) Explain the applications of Management Information Systems (MIS) in the service industry. **[8]**

P.T.O.

Q5) a) Explain in detail the components of Enterprise Management Systems (EMS). **[8]**

b) What is Enterprise Resource Planning (ERP)? Describe standard Enterprise Resource Planning (ERP) modules. **[8]**

OR

Q6) a) What are the steps in Business Process Re-engineering (BPR)? Explain the value stream model of organization. **[8]**

b) What is Business Process Outsourcing (BPO)? Explain the various types of Business Process Outsourcing (BPO). **[8]**

SECTION - II

Q7) a) Explain B2B, B2C and C2C types of e-Commerce. **[9]**

b) What is Supply Chain Management (SCM)? Explain the role of Supply Chain Management (SCM) and give its benefits. **[8]**

OR

Q8) a) Explain the benefits, challenges and trends in Customer Relationship Management (CRM). **[9]**

b) Write short notes on:

i) e-Commerce applications

ii) Electronic fund Transfer **[8]**

Q9) a) What is Decision Support System (DSS)? Explain the benefits and risks of decision support system? **[9]**

b) Write short notes on: **[8]**

i) Applications of Artificial Intelligence.

ii) Geographical Information Systems (GIS)

OR

Q10)a) What is Data Warehouse? Explain the steps involved in implementation of a Data Warehouse. **[9]**

b) Explain the following: **[8]**

i) Knowledge based expert systems.

ii) Executive Information Systems.

Q11)a) Explain fault tolerant systems. What do you understand by contingency management? **[8]**

b) Explain the following:

i) Software piracy

ii) Global IT strategies **[8]**

OR

Q12)a) What is the Need of Information Security? Explain biometric security. List the different hacking techniques. **[8]**

b) Explain the ethical responsibilities of business professional. **[8]**

■■■

Total No. of Questions : 12]

SEAT No. :

P962

[Total No. of Pages : 4

[4163] - 13
T.E. (Mech.)
THEORY OF MACHINES AND MECHANISMS - II
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule. Mollier charts, electronic pocket calculator and stem tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the following terms related with friction:

i) Over hauling and self locking screw.

ii) Efficiency of self locking screw.

iii) Friction in turning pair. **[6]**

b) The mean diameter of the thread of a bolt is 30 mm with pitch of 6 mm and 'V' angle of 55^o. The bolt is fightened. by a nut with bearing surface having mean diameter of 60 mm at which the load may be assumed to be acting. The coefficient of friction of the thread and at the bearing surface may be taken as 0.1 and 0.15 respectively.

Find the force required to be applied at the end of a spanner of 500 mm length with the tension in the bolt as 12 kN when **[10]**

i) Tightening, and

ii) Loosening the bolt

OR

Q2) a) Differentiate between flat belt and ree belt . **[6]**

b) A leather belt is required to transmit 8 kW from a pulley 1.5m diameter running at 240 rpm. The angle of contact is 160^o and Coefficient of friction between the belt and pulley is 0.25. The safe working stress for leather is 1.5MPa and density of leather is 100 kg/m^3. Determine the width of the belt if its thickness is 10 mm. Take into account the effect of centrifugal tension. **[10]**

P.T.O.

Q3) a) Derive an expression for torque transmitting capacity of a one clutch with uniform wear condition. **[6]**

b) 80 kW power is transmitted at 2400 rpm by a multiplate disc friction clutch. The plates are in oil and have the friction surface of steel and phospher bronze alternately, $\mu = 0.08$ and the axial intensity of pressure is not to exceed 1-5 bar. External radius is 1.25 times the internal radius, and the external radius is 12.5cm. Determine the number of plates needed to transmit the required torque. Assume uniform wear. **[10]**

OR

Q4) a) Explain Basis-Gibson flash light torsion dynamometer with sketch. **[6]**

b) A band and blocks brake with 15 blocks, each of which subtends an angle of 15^o, is applied to a drum of 1m diameter as shown in fig.1. The drum and fly wheel mounted an the same shaft has a mass of 1500 kg and combined radius of gyration of 500 mm. Find a) maximum braking torque, b) angular retardation of the drum and c) time taken by the system to come to rest from the rated speed of 380 rpm. The coefficient of reaction between the drum and blocks is 0.25. **[10]**

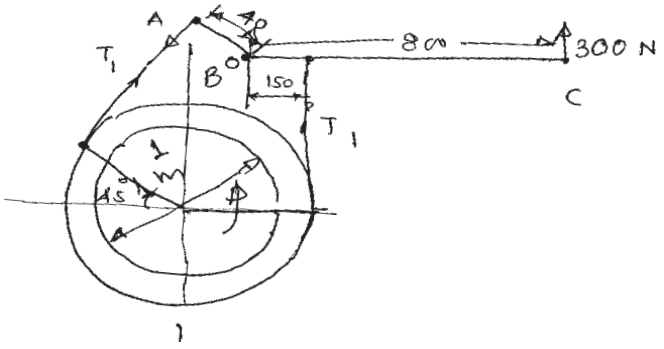


Figure. 1.

Q5) The following data relate to a cam profile in which the follower moves with cycloidal motion during the lift and returning if with uniform acceleration and retardation, acceleration being half the retardation

Min radius of Cam = 30 mm
Roller radius = 10 mm
Lift of the follower = 45 mm
Offset of the follower = 12 mm towards right.
Angle of ascent = 70^o
Angle of descent = 120^o
Angle of dull between ascent and descent = 45^o
Speed of cam = 200 rpm.

Draw the cam problem and determine maximum velocity and maximum acceleration during lift and return. **[18]**

OR

Q6) a) Describe kinematic equivalent of CAM -FOLLOWER system with sketches and examples. **[6]**

b) Explain cam jump phenomenon. What are different methods to avoid it. **[6]**

c) Derive the expression for displacement, velocity& acceleration for 2.3 polynomial D-R-D can with sketches. **[6]**

SECTION - II

Q7) a) Explain the principle of inertia Governor. **[4]**

b) A machine requires a torque of $(500 + 50 \sin \theta)$ kg.m. to drive it, where θ is the angle of rotation of shaft measured from certain datum. The machine is directly coupled to an engine which produces a torque of $(500 + 60 \sin \theta)$ kg.m. The flywheel and other rotating parts attached to the engine weigh 5000 kg and have a radius of gyration of 30 cm. If the mean speed is 150 r.p.m, find:

i) the fluctuation of energy

ii) the percentage fluctuation of speed

iii) the maximum and minimum angular acceleration of the flywheel and corresponding shaft positions. **[12]**

OR

Q8) a) Compare flywheel and Governor. **[4]**

b) The length of the upper and lower arms of a porter governor are 20 cm and 25cm respectively. Both the arms are pivoted on the axis of rotation. The central load is 150 N, the weight of each ball is 20N and the friction of the sleeve together with the resistance of the operating gear is equivalent to a force of 30N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30^o and 40^o.

Determine the range of speed of the governor. **[12]**

Q9) a) Obtain an expression for the virtual number of teeth for a helical gear. **[6]**

b) A pinion of 12cm. p.c.d. meshes with a gear wheel of 40 cm p.c.d. The teeth are of involute profile with 2mm module and 25^o pressure angle. Addendum for each wheel is 6mm. Find the angle that the pinion turns through while any one pair of teeth continue to maintain contact, If the pinion is driven and rotates at 200 r.p.m. find the velocity of sliding at the instant of contact ceases. **[12]**

OR

Q10)a) Compare cycloidal and involute gear profile. **[4]**

b) What do you mean by undercutting and interference in involute gear. **[4]**

c) Two mating gears have 20 and 40 teeth of module 10 mm and 20 pressure angle. If addendum on each wheel is such that path of contact is maximum and interference is just avoided, find the path of contact, are of contact and contact ratio. Also find the addendum of each wheel. **[10]**

Q11)a) Derive equation for centre distance between two spiral gear. **[4]**

b) Two shafts A and B are coaxial. A gear C (50 teeth) is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G.D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. Gear G is fixed and is concentric with shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B.

i) sketch the arrangment

ii) find the number of teeth on internal gear G assuming that all gears have the same module.

iii) if shaft A rotates at 110 r.p.m., find the speed of shaft B. **[12]**

OR

Q12)a) Prove that for maximum efficiency in case of spiral gears.

$$\alpha = \frac{\theta + \phi}{2}$$

ϕ – friction angle

θ – shaft angle

α – spiral angle **[6]**

b) What do you mean by gear train? Mention the different types of gear train. **[4]**

c) The spiral gear drive is used to transmit the power from one shaft to the other shaft. The shaft angle is 90^{o} The two wheels are of equal diameters with normal pitch of 9mm. The centre distance is approximately 150 mm. The speed ratio of the drive is 5:2. find : **[6]**

i) Transverse pitch of each wheel.

ii) Spiral angles

iii) Number of teeth on each wheel.

■■■

Total No. of Questions : 12]

SEAT No. :

P1030

[Total No. of Pages : 3

[4163] - 133
T.E. (Information Technology)
DATA COMMUNICATION & NETWORKING
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Calculate the CRC if the data to be sent is 100100 the generator polynomial $g(x) = x^3 + x^2 + 1$. **[8]**

b) Explain the shift keying techniques with suitable diagram and constellation pattern for the following.

i) PSK

ii) FSK

iii) ASK

iv) QAM **[10]**

OR

Q2) a) Discuss the hamming code technique. Calculate hamming code if data to be sent is 1011011. **[9]**

b) What is channel capacity? How is it related to channel bandwidth? Example with an appropriate formula. **[9]**

Q3) a) Explain FDM and statistical TDM. **[8]**

b) Compare Circuit Switching, Message Switching & Packet Switching. **[8]**

OR

Q4) a) Describe the T1 frame structure. Also state the capacities of E1, E2, E3 and E4 lines. **[8]**

b) Discuss how ADSL technology used in modems. **[8]**

P.T.O.

Q5) a) Explain with suitable examples guided transmission media and unguided transmission media. **[8]**

b) Explain the principle of light propagation in fiber optic communication. **[8]**

OR

Q6) a) Compare : **[8]**

i) Single mode and multimode fiber.

ii) Step index and graded index fiber.

b) Discuss various losses occurring in fiber optic communication. **[8]**

SECTION - II

Q7) a) Describe the functions of all the layers of the OSI reference model in short. **[8]**

b) Explain following network topologies with the neat diagrams **[8]**

Star Topology, Bus Topology, Mesh Topology, Hierarchical Topology.

OR

Q8) a) Explain TCP/IP protocol Stack. **[8]**

b) Compare Bridge, Switch, Hub, Repeater. **[8]**

Q9) a) Explain Go-Back-n ARQ, Stop & Wait ARQ and selective repeat ARQ in detail. **[9]**

b) Discuss CSMA/CD Random Access techniques. How is collision avoidance achieved in the same. **[9]**

OR

*Q10)*a) Discuss the HDLC protocol specification with reference to the following :

i) Station types

ii) Configurations

iii) Modes of communication

iv) Types of frames **[9]**

b) Explain ALOHA, Slotted ALOHA and CSMA/CD. Also comment on efficiency of each. **[9]**

Q11)a) What is FDDI? Explain FDDI frame types. **[8]**

b) Differentiate: 10Base5, 10Base2, 10BaseT Specification. **[8]**

OR

Q12)a) Discuss the working of VLAN. Also state its advantage. **[8]**

b) Write a short note on Gigabit Ethernet. Compare Gigabit Ethernet with Traditional Ethernet. **[8]**

■■■

Total No. of Questions : 12]

SEAT No. :

P1034

[Total No. of Pages : 3

[4163] - 137
T.E. (Information Technology)
MANAGEMENT INFORMATION SYSTEMS
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate books.***
2) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different types of information systems required at different levels of management hierarchy. Also write various managers at different levels of management in organization like engineering college. **[9]**

b) Clarify the concept of Management Information System highlighting its advantages and limitations. **[9]**

OR

Q2) a) Write importance of Organizational Culture and Organizational Power in an organization. **[9]**

b) What is organizational structure? Explain various types of organizations structures. Also comments on its span of control. **[9]**

Q3) a) What are the major tasks performed by personal management system? What are the various subsystems a personal management system uses to perform those tasks? **[8]**

b) Describe the procedure involved in building a MIS for marketing airline service industry. **[8]**

OR

P.T.O.

Q4) a) What is the need of collaboration systems in manufacturing? Explain Enterprise application Integration. **[8]**

b) Discuss the utility of MIS in the areas of Production and Marketing. **[8]**

Q5) a) What do you mean by Outsourcing? What are the challenges faced by BPO industry today? **[8]**

b) Explain the need of Enterprise Management System? Write the components of EMS. **[8]**

OR

Q6) a) What are the services offered by call centers? Explain inbound call center service. **[8]**

b) What is information technology architecture? Explain examples of different architectures. **[8]**

SECTION - II

Q7) a) Explain various models used in e-commerce? Also explain various resources required for setting e-commerce firm. **[8]**

b) Explain various essential e-Commerce processes. **[8]**

OR

Q8) a) What is CRM? Write the challenges and trends in Customer Relationship Management. **[8]**

b) Explain challenges in implementing IT based transformation of the Organization. **[8]**

Q9) a) Define Decision Support System. With the aid of diagram explain Herbert Simon model for decision making. **[8]**

b) Explain the use of data-warehouse and data-mining concepts for decision making process. **[8]**

OR

Q10)a) Explain the use of Artificial Intelligence and GIS concepts for decision making process. **[8]**

b) Differentiate between Decision Support System and Transaction Processing System. **[8]**

Q11)a) Why Computerized Information systems are more vulnerable to many more kinds of threats than manual systems? Name some of the key areas where large amounts of data stored in electronic form are most vulnerable . **[6]**

b) What are ethics? What are various ethical responsibility of business professionals? **[6]**

c) As a project manager in a software company what measures you would suggest to stop software piracy? **[6]**

OR

Q12)a) Explain cultural, political and geo-economic challenges in global Management of Information Technology. **[6]**

b) Explain contingency management and its solutions. **[6]**

c) What are the major security and privacy issues in conducting on-line examination where results are also declared on-line? **[6]**

■■■

Total No. of Questions : 12]

SEAT No. :

P1036

[Total No. of Pages : 3

[4163] - 139
T.E. (IT)
SOFTWARE ENGINEERING
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain CMMI process Model and its levels. With the example describe process areas defined at the CMMI levels. **[6]**

b) Explain Software Myths. **[6]**

c) What is the purpose of process assessment? Why has SPICE been developed as a standard for Process Assessment? **[6]**

OR

Q2) a) Explain software process models with the help of diagrams applicable for following scenarios. **[9]**

i) Large scalable modular projects having time constraints on it, where High Performance is not an issue (RAD)

ii) Application in which detailed software requirements are not clear and just the general objective of the software are defined by the customer. (Prototype)

iii) Large scale and high risk software systems. (Spiral)

b) Explain phases of Unified Process with the help of diagram. **[6]**

c) Explain failure curve for software with the help o diagram. **[3]**

P.T.O.

Q3) a) Select any large system or product with which you are familiar. Define the set of domains that describe the World view of the system or product. Describe the set of elements that make up one or two domains. For one element, identify the technical components that must be engineered. **[8]**

b) Business Process Engineering strives to define data and application architecture as well as technology infrastructure. Describe what each of these terms means and provide an example. **[8]**

OR

Q4) a) Explain the seven core principles that focus on Software Engineering Practice as a whole. Who proposed these Principles? **[8]**

b) State the three actions that encompass the deployment activity. Explain the key principles of testing. **[8]**

Q5) a) State and explain in brief requirement engineering tasks. **[10]**

b) Draw and explain the traceability table for requirement management. **[6]**

OR

Q6) a) Draw and explain level 0, level 1, level 2. Data Flow diagram for "ATM System". **[8]**

b) Draw and explain complete Use Case diagram for "online book store". **[8]**

SECTION - II

Q7) a) Explain the various styles used in creating architectural design. **[8]**

b) In brief explain various design model elements. **[8]**

OR

Q8) a) What do you mean by Architectural Context Diagram (ACD)? Give an example ACD for a burglar alarm system. **[8]**

b) Explain the features of a good user interface design. **[8]**

Q9) a) With examples define the following terms with respect to project management : **[8]**

i) Measure ii) Metric

iii) Measurement iv) Indicator

b) Explain the process of calculating function points. **[6]**

c) Write a note on W^5HH principle. **[4]**

OR

Q10)a) Explain the different types of metrics used for web engineering projects. **[8]**

b) Explain use case based estimation model. **[6]**

c) Write a note on make /buy decision tree. **[4]**

Q11)a) Explain the various levels of Software Configuration Management (SCM) Process. **[8]**

b) Write short note on "identification of objects in the software configuration". **[4]**

c) Explain forward engineering for client/server architecture. **[4]**

OR

Q12)a) Explain the process of change control in detail **[8]**

b) Write a note on SCM repository. **[4]**

c) What is the importance of version control. **[4]**

■■■

Total No. of Questions : 12]

SEAT No. :

P1583

[Total No. of Pages : 2

[4163] - 149
T.E. (Biotechnology) (Common to Chemical)
CHEMICAL REACTION ENGINEERING - I
(Sem. - II) (2003 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Use of Programmable calculator is not allowed.***
3) ***Draw a neat sketch wherever necessary.***
4) ***Make necessary assumptions wherever required.***
5) ***Answer any three questions from Section - I and any three questions from Section - II.***

SECTION - I

Q1) The irreversible reaction A + 2B = 2D is exothermic at low temperatures and the rate law is $-r_A = C_A^{1/2} C_B$. Suggest a rate law that is valid at high temperatures, where the reaction is reversible. $A + 2B \Leftrightarrow 2D$. **[16]**

OR

Q2) Explain the following non elementary kinetic models and mechanisms : **[16]**

a) Free radicals, chain reaction mechanisms.

b) Molecular intermediates, non chain mechanisms.

Q3) Find the overall order of the irreversible reaction. $2H_2 + 2NO = N_2 + 2H_2O$ from the following constant volume data using equimolar amounts of hydrogen and nitric oxide. **[16]**

Total pressure, mm Hg	200	240	280	320	360
Half life, sec	265	186	115	104	67

OR

Q4) Derive rate expression for autocatalytic reaction. Plot conversion-time and rate-concentration curves for autocatalytic reaction. **[16]**

P.T.O.

Q5) Derive performance equation for plug flow reactor with its graphical representation. **[18]**

OR

Q6) Derive tanks in series model equation for equal sized first order reaction. **[18]**

SECTION - II

Q7) Write short notes on : **[18]**

a) Instantaneous fractional yield.

b) Overall fractional yield

Also deduct the relationship between the above two for mixed flow reactor

OR

Q8) Develop the concentration vs time curves for the reaction $A \rightarrow R \rightarrow S$ with rate constants k_1 and k_2 with $C_{R0} = C_{S0} = 0$ occurring in mixed flow reactor. Show that $\tau_{opt} = 1/\sqrt{k_1 k_2}$. **[18]**

Q9) Calculate the heat of reaction for the synthesis of ammonia from hydrogen and nitrogen at 150°C in Kcal/mol of N_2 reacted and in KJ/mol of H_2 reacted. **[16]**

$\Delta H_{fNH_3} = -11,020 \text{cal/mol } N_2$

$\hat{C}_{PH_2} = 6.992 \text{ cal/mol } H_2 . K$

$\hat{C}_{PN_2} = 6.984 \text{ cal/mol } N_2 . K$

$\hat{C}_{PNH_3} = 8.92 \text{ cal/mol } NH_3 . K$

OR

Q10) Describe optimum temperature progression in MFR. **[16]**

Q11) Discuss and draw general shape of temperature Vs conversion plot for the following reactions. **[16]**

a) Reversible exothermic reaction.

b) Irreversible reaction.

OR

Q12) Write short notes on :

a) Segregated flow model **[16]**

b) Tanks in series model.

■■■

Total No. of Questions : 12]

SEAT No. :

P966

[Total No. of Pages : 4

[4163] - 17
T.E. (Mechanical)
TRIBOLOGY
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the 'Tribological problems' in industry. **[6]**

b) Explain different methods of recycling of used oil. **[6]**

c) Explain measurement of viscosity by Saybolt Universal Viscometer. **[4]**

OR

Q2) a) Explain the effect of temperature and pressure on viscosity of the lubricant. **[6]**

b) Explain the major factors influencing the selection of lubricants. **[4]**

c) Compare sliding contact bearings and rolling contact bearings with reference to:

i) Starting friction;
ii) Speed;
iii) Load carrying capacity;
iv) Life;
v) Noise and
vi) Positional accuracy. **[6]**

Q3) a) Using deformation theory, derive the equation for coefficient of friction with usual notations. **[6]**

b) Explain different factors affecting wear rate. **[6]**

c) Explain stiction in detail. What are different methods to reduce stiction effect? **[4]**

OR

Q4) a) Derive Archard's equation for volume of adhesive wear with usual notations. What are the assumptions made? **[8]**

P.T.O.

b) Write short note on any two of the following:
   i) Stick Slip Friction;
   ii) Tomlinson's theory of molecular attraction;
   iii) Coulomb's theory of interlocking;
   iv) Surface fatigue wear. **[8]**

Q5) a) Derive the Reynold's equation in two dimensional form with usual notations. State the assumptions made in the equation.

$$\frac{\partial}{\partial x}\left[h^3\frac{\partial p}{\partial x}\right]+\frac{\partial}{\partial y}\left[h^3\frac{\partial p}{\partial x}\right]=-6\mu U\frac{\partial h}{\partial x}$$ **[12]**

b) Explain the following terms with reference to hydrodynamic journal bearings: **[6]**
   i) Design variables
   ii) Performance variables
   iii) Sommerfeld number

OR

Q6) a) The following data is related to a 360° hydrodynamic journal bearing:
- Journal diameter = 100 mm
- Bearing length = 50 mm
- Journal Speed = 1500 RPM
- Minimum oil film thickness = 15 microns
- Viscosity of the lubricant = 30 cP
- Specific gravity of lubricant = 0.86
- Specific heat of lubricant = 2.09 kJ/kg°C
- Fit between the journal and bearing = normal running fit H_7e_7

Calculate:
   i) Load carrying capacity of bearing;
   ii) The coefficient of friction;
   iii) Power lost in friction;
   iv) Flow requirement in litre/min;
   v) Side leakage and
   vi) Temperature rise.

Diameter, mm	**Tolerances, mm**	
	H_7	**e_7**
100	+ 0.035	– 0.072
	+ 0.00	– 0.107

[12]

Table 1: Dimensionless parameters for 360° Hydrodynamic journal bearings

L/D	**h_o/C**	**ε**	**S**	**(r/C).*f***	**$(Q/r.Cn_sL)$**	**Q_s/Q**	**P_{max}/P**
	0.1	0.9	0.0313	1.60	5.69	0.939	4.854
0.5	0.2	0.8	0.0923	3.26	5.41	0.874	3.745
	0.4	0.6	0.319	8.10	4.85	0.730	2.739
	0.6	0.4	0.779	17.0	4.29	0.552	2.267

b) Explain different regimes of hydrodynamic lubrication with the help of Stribeck curve. **[6]**

SECTION - II

Q7) a) Derive an expression for flow rate and pressure distribution for a hydrostatic step bearing with neat diagram. Show the pressure distribution in the bearing. **[8]**

b) Explain different compensating elements in hydrostatic lubrication system. **[8]**

OR

Q8) a) The following data is related with the hydrostatic step bearing:

- Shaft Speed = 720 RPM
- Supply pressure = 5 Mpa
- Shaft diameter = 400 mm
- Recess diameter = 250 mm
- Film thickness = 0.15 mm
- Viscosity of the lubricant = 30 cP
- Specific gravity of lubricant = 0.86
- Specific heat of lubricant = 1.76 kJ/kg^{o}C

Calculate:

i) The load carrying capacity of bearing;
ii) The flow requirement in lpm;
iii) The pumping power loss;
iv) The frictional power loss; and
v) The temperature rise, assuming the total power loss in bearing is converted into the frictional heat. **[10]**

b) Explain different power losses in hydrostatic step bearings. **[6]**

Q9) a) Derive the expression for the pressure distribution, load carrying capacity and time of approach for squeeze film lubrication between parallel rectangular plates. **[10]**

b) Why lubrication is required in metal working? Explain the type of lubrication used in metal working. **[4]**

c) State various applications of gas bearings. **[2]**

OR

Q10)a) A circular plate of 60 mm radius is approaching the base plane at a velocity of 150 mm/s at the instant when the oil film thickness is 0.2 mm. If the absolute viscosity of the oil is 0.025 Pa-s, calculate:

i) The load carrying capacity of the oil film at the given instant;
ii) The maximum pressure; and
iii) The average pressure. **[6]**

b) Compare oil lubricated bearings and gas lubricated bearings with the help of following points:

i) Absolute viscosity of lubricant;
ii) Viscous resistance;
iii) Frictional power loss;
iv) film thickness:
v) surface finish and
vi) Shock loads. **[6]**

c) State the lubricants used in Hot metal working. **[4]**

Q11)a) Derive an expression for pressure distribution in narrow width tapered pad bearings with neat sketch. State the assumptions made. **[10]**

b) State the properties of bearing materials which govern the selection of material for sliding contact bearings. **[6]**

c) Give the applications of Elasto-hydrodynamic lubrication **[2]**

OR

Q12)a) The Rayleigh step bearing of length 213 mm and width 860 mm is required to support 150 kN load. The sum of surface roughness on contacting surfaces of bearing is 5 microns. The minimum oil film thickness required is 20 times the sum of surface roughness on contacting surfaces. The sliding velocity is 8 m/s. Using optimum conditions, calculate:

i) the location of step;
ii) the maximum oil film thickness;
iii) the viscosity of the lubricating oil; and
iv) the ratio of maximum pressure to average pressure. **[8]**

b) Explain with neat sketches, the solid bushing and lined bushing. **[6]**

c) How Elasto-Hydrodynamic Lubrication (EHD) differs from hydrodynamic lubrication? **[4]**

■■■

Total No. of Questions : 12]

SEAT No. :

P1688

[Total No. of Pages : 4

[4163] - 25
T.E. (Mechanical) (Mechanical S/W)
THERMAL ENGINEERING - II
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain important components of simple vapour compression refrigeration system & discuss function of each. **[5]**

b) Give classification of refrigerant. **[5]**

c) A refrigerating system working on Bell coleman cycle receives air from cold chamber at - 5°c & compresses it from 1 bar to 4.5 bar. The compressed air then cooled to temperature of 37°C before it is expanded in expander. Calculate cop of system when compression and expansion are i) Isentropic ii) Follow the law $PV^{1.25} = C$. **[6]**

OR

Q2) a) Explain with neat sketch aqua-ammonia vapour absorption refrigeration system. **[5]**

b) What is subcooling? How subcooling affects performance of VCR cycle. **[5]**

c) The capacity of refrigerator is 200 TR when working between - 6°C and 25°C. Determine man of ice produced per day from water at 25°C. Also find power required to drive the unit. Assume cycle operates on reversed carnnot cycle & latent heat of ice is 335 kj/kg. **[6]**

Q3) a) Explain the following terms : **[6]**

i) Degree of saturation.
ii) Relative humidity.
iii) Sensible Heat factor.

b) Write note on bypass factor. **[4]**

P.T.O.

c) 2 kg of air at 40ºC DBT & 50% relative humidity is mixed with 3kg of air at 20º DBT and 12ºC DPT. Calculate specific humidity of the mixture & dry bulb temperature of mixture. (Use psychrometric chart). **[6]**

OR

Q4) a) Explain the factors affecting human comfort. **[6]**

b) Give applications at air conditioning. **[4]**

c) 100 m^3/min of air at 15ºC DBT & 80%. RH is heated until its temperature is 25ºC. Find the following.

i) Heat added to air in kj/min.

ii) RH of heated air.

Assume air pressure as 100 kpa. **[6]**

Q5) a) Explain various methods to improve isothermal efficiency of reciprocating air compressor. **[6]**

b) Draw P-V and T-S diagram for single stage reciprocating air compressor without clearance & derive expression for work done when compression is isothermal. **[6]**

c) A three stage compressor compresses air from 1 bar & 26ºC to 36 bar. The law of compression is $PV^{1.3}$ = constant & is same for all three stages of compression. Assuming perfect intercooling & neglecting clearance, find minimum power required to compress 0.25 m^3/s of free air. Also find intermediate pressures. **[6]**

OR

Q6) a) Derive an expression for efficiency of Roots blower is terms of pressure ratio & ratio of specific heat. **[6]**

b) Differentiate between centrifugal compressor and axial flow compressor. **[6]**

c) A rotary air compressor compresses 100kg of air per minute from 1.2 bar & 20ºC to 4.8 bar. Find power required by the compressor, if compression is isentropic and by the relation $PV^{1.5} = C$.

Take Cp = 1.008 kj/kg k. **[6]**

SECTION - II

Q7) a) Describe the phenomenon of detonation or knocking in SI engine. **[6]**

b) What are the basic requirements of good SI engine combustion chamber. **[6]**

c) Discuss the effect of following engine variables on flame propagation.

i) Fuel-air ratio.

ii) Compression ratio.

iii) Turbulence. **[4]**

OR

Q8) a) Explain the stages of combustion in CI engine with the help of P-Q diagram. **[6]**

b) Explain how the induction swirl is created. What are the requirements of injector with this type of swirl. **[6]**

c) What is importance of delay period? It is usually divided into two parts. Name and Describe them. **[4]**

OR

Q9) a) What is superchanging? How is it achieved? What are the advantages of superchanging. **[6]**

b) What is pulse converter? What are its advantages & disadvantages. **[6]**

c) Where the sources of emission in SI engine. **[4]**

OR

Q10)a) Explain with neat sketch catalytic converter. **[6]**

b) Explain with neat sketch flame ionisation detector for measurement of HC. **[6]**

c) What are the limits of supercharging in SI & CI engine. **[4]**

Q11)a) Compare open cycle & closed cycle gas turbine. **[5]**

b) Explain in detail open cycle gas turbine with regeneration. **[5]**

c) A gas turbine unit receives air at 1 bar and 300K & compresses it adiabatically to 6.20 bar. The compressor efficiency is 88%. The fuel has heating value of 44186 kj/kg & fuel air ratio is 0.017 kg of fuel/kg of air. The turbine internal efficiency is 90%. Calculate the work of turbine and compressor per kg of air compressed & thermal efficiency for air Cp = 1.005 kj/kg k, r = 1.4 & for products of combustion Cp = 1.147 kj/kg k & γ = 1.333.**[8]**

OR

Q12)a) Explain the following terms. **[5]**

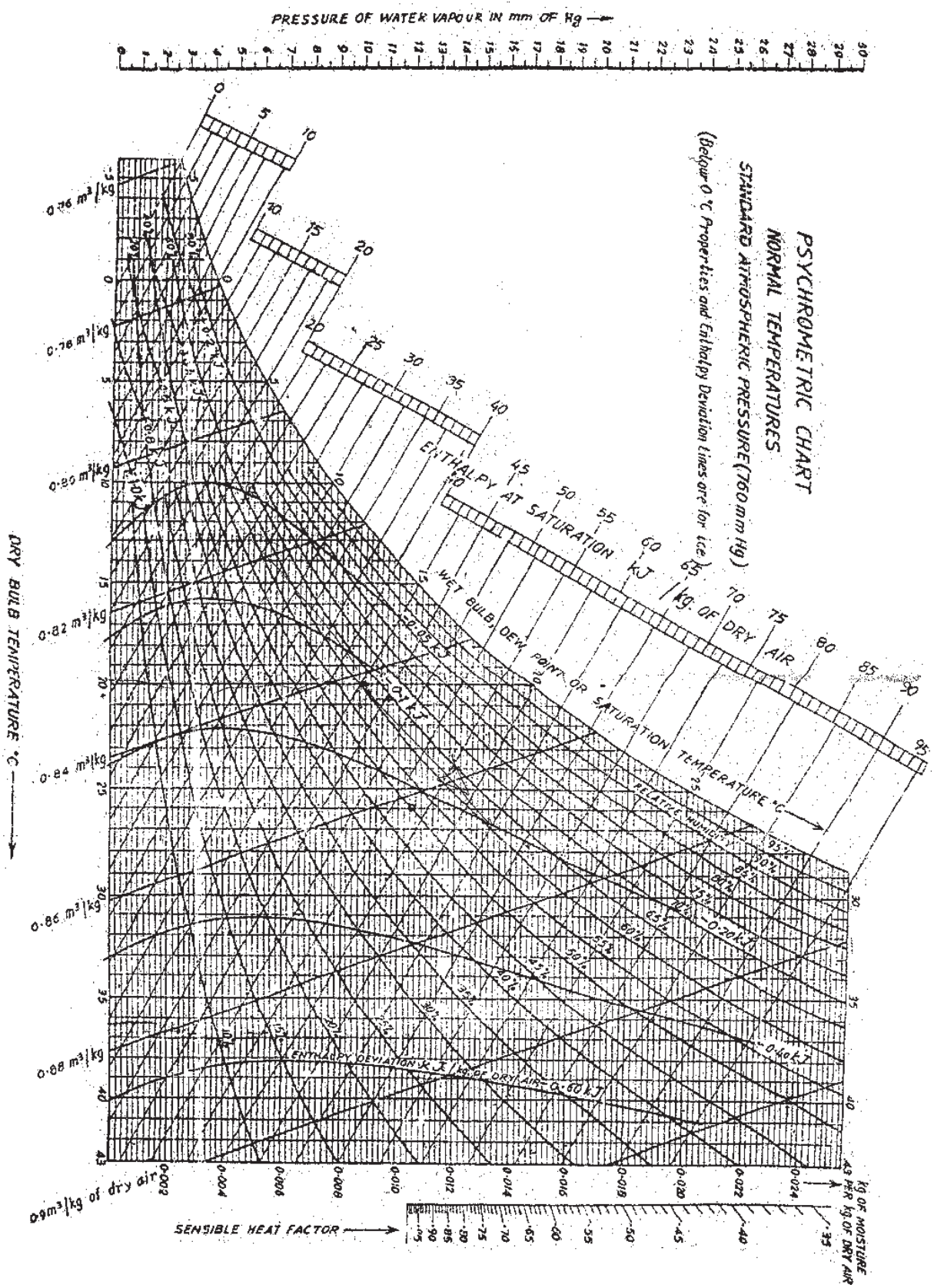
i) Thrust, thrust power.

ii) Propulsive Power, Propulsive efficiency.

iii) Overall efficiency.

b) Explain with neat sketch turbo jet engine. What are its advantages. **[5]**

c) Air enters at rate of 900 kg/min into a compressor of jet aircraft travelling at 241 m/sec. The air-fuel ratio is 60:1 and compression pressure ratio is 6 : 1. The calorific value of fuel is 41820 kj/kg. Neglecting all losses calculate the thrust, specific fuel consumption and propulsive efficiency.**[8]**


PSYCHROMETRIC CHART
NORMAL TEMPERATURES
STANDARD ATMOSPHERIC PRESSURE (760 mm Hg)
(Below 0 °C Properties and Enthalpy Deviation lines are for ice)
PRESSURE OF WATER VAPOUR IN mm OF Hg
ENTHALPY AT SATURATION kJ / kg. OF DRY AIR
DRY BULB TEMPERATURE °C
WET BULB, DEW POINT OR SATURATION TEMPERATURE °C
RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ / kg OF DRY AIR
SENSIBLE HEAT FACTOR
kg PER kg OF DRY AIR
kg OF MOISTURE PER kg OF DRY AIR

■■■

Total No. of Questions : 12]

SEAT No. :

P1693

[Total No. of Pages : 3

[4163] - 47
T.E. (Electrical)
MICROCONTROLLER AND ITS APPLICATIONS
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write the assembly language program to copy the contents of 8 registers R0 - R7 to external RAM location from D000H after reset. **[8]**

b) Explain the functions of following pins **[8]**

i) $\overline{EA}$

ii) $\overline{PSEN}$

iii) ALE

iv) MOVX

v) MOVC

OR

Q2) a) Explain the RAM organization of 8051. **[8]**

b) Draw the interfacing diagram with 8051 for the data given-8 KB of EPROM (Program memory) , 4 KB of data RAM such that the following maps are realized. **[8]**

EPROM 0000H - 1FFFH

RAM 2000H - 2FFFH

Q3) a) Write a program to transfer a message "2012" serially at a baud rate of 9600. **[8]**

b) Draw the SCON register and explain the function of TI flag **[8]**

OR

P.T.O.

Q4) a) Write a program which will sample pin P1.0. When the status on the pin is 0 generate a square wave of 50Hz on pin P2.0. Crystal frequency is 11.0592 Mhz. **[8]**

b) Write a program initialize the stack pointer to a location 35H and push the content of registers R0 to R7 of bank 2 on to the stack. **[8]**

Q5) a) What is the difference between RET and RETI instructions? Explain why we cannot use RET instead of RETI as the last instruction of ISR. **[8]**

b) Explain the following instructions **[10]**

XCHD A, @Ri

MOV A, @Ri

RRC A

DAA

SETB C

OR

Q6) a) Write a program to clear the contents of internal RAM location 40H to 7 FH. **[8]**

b) Explain the following instructions. **[10]**

MOVX @Ri,A

MOV C,P1.7

MOV 05H,09H

SWAP

DJNZ

SECTION - II

Q7) a) Explain the steps to transfer and receive data serially in 8051 and importance of TI and RI flag. **[8]**

b) Explain interrupt structure of 8051 with vector addresses. Also explain IE and IP SFRs. **[8]**

OR

Q8) a) Write a short note on simulator, emulator, assembler and compiler used for 8051 chip. **[8]**

b) Explain the salient features of members of MCS -51 family. **[8]**

Q9) a) Draw the interfacing diagram and explain the control of two stepper motors connected to port 2 of 8051. Write the assembly program to rotate the stepper motors in same direction continuously. **[10]**

b) Explain with suitable diagram, temperature measurement using 8051 and write assembly program to store temperature value in accumulator. **[8]**

OR

Q10) Write a short note on- **[18]**

[Assembly program is not expected]

a) Humidity measurement using 8051.

b) D. C. motor speed control methods using 8051.

c) Level measurement using 8051.

Q11) a) Draw functional block diagram of 8096 chip. **[6]**

b) Architecture of 8096. **[4]**

c) Explain the features MCS - 96 family of microcontrollers **[6]**

OR

Q12) a) Internal memory structure in 8096 family. **[6]**

b) Explain the function of watch dog timer block in 8096. **[4]**

c) Explain PWM output generation using 8096. **[6]**

■■■

Total No. of Questions : 12]

SEAT No. :

P985

[Total No. of Pages : 3

[4163] - 52
T.E. (Electronics / E & TC)
ANALOG INTEGRATED CIRCUITS DESING AND APPLICATIONS
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the need of level shifter block in OP-Amp. Explain different circuits used for level Shifter. **[10]**

b) State & explain various OP-AMP parameters that makes it to be used as comparator. **[8]**

OR

Q2) a) Explain various differential amplifier stage configuration used for OP-AMP? Discuss merits & demerits of those stages. **[8]**

b) With neat circuit diagram explain necessity and working of **[10]**

i) Active load for differential Amplifier.

ii) Current mirror circuit.

Q3) a) Explain practical integrator with neat circuit diagram. Draw its frequency response & Explain how it different from basic integrator. Design practical integrator having cut off Frequency of 1.5kHz. **[8]**

b) Explain the necessity of linearization of signal and describe any two type of linearization. **[8]**

OR

P.T.O.

Q4) a) Design a digitally programmable instrumentation amplifier having an overall gain of 1v/v, 10v/v & 100v/v. **[8]**

b) Explain voltage to current & current to voltage convertor with neat diagram for floating load. **[8]**

Q5) a) Write a short note on: **[8]**

i) Peak Detector.

ii) Clipper & Clamper using OP-AMP.

b) Discuss the need of S/H circuit & Define **[8]**

i) Acquisition time

ii) Aperture time

OR

Q6) a) A Schmitt trigger with LTP = 0V & hysteresis Vh = 0.2V used to convert sine wave of 4 Vpp to Square wave. Calculate the time duration of negative & positive portion of the waveform. **[8]**

b) Draw and explain neat diagram & waveform of full wave precision rectifier & find Vo/Vin for Vin>0 And Vo/Vin for Vin<0. **[8]**

SECTION - II

Q7) a) With the help of circuit diagram and waveform, Explain working of frequency to voltage convertor. **[8]**

b) Draw Astable multivibrator using IC555. Explain its working with neat waveform. Design it with fo = 10kHz & D(%) = 75. **[10]**

OR

Q8) a) State typical requirement of VCO. With neat diagram& wave form. Explain change balancing V_{FC}. **[8]**

b) Draw & Explain the function generator using IC 8038. **[10]**

Q9) a) Design Band stop filter for F_1 = 500 Hz & F_2 = 5 kHz. **[8]**

b) Explain how LPF can be transformed into BPF by frequency transformation. **[8]**

OR

Q10)a) Using equal component, Design specify elements for a second order LPF with for F = 1kHz & Q = 5. What is its DC gain? **[8]**

b) Draw & explain the operation of sallen & Key HPF using OP-AMP. **[8]**

Q11)a) Explain following application of PLL : **[8]**

i) Frequency multiplier.

ii) AM Demodulator.

b) Design a VCO as FM generator using 566 for f = 10kHz & FC = 100kHz? Draw suitable diagram. **[8]**

OR

Q12)a) Draw & Explain the temperature compensated log Amplifier. Derive the expression for output voltage. **[8]**

b) Explain what is PLL with operation? Explain following parameters. **[8]**

i) Lock range.

ii) Capture range.

iii) Fall in time.

■■■

Total No. of Questions : 12]

SEAT No. :

P1573

[Total No. of Pages : 3

[4163] - 6
T.E. (Civil)
ADVANCED SURVEYING
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Figure to the right indicate full marks.***

SECTION - I

Q1) a) State the objectives of Geodetic triangulation. Classify the systems of triangulation and explain any one system with specifications and sketch. **[8]**

b) State methods of baseline measurement and explain any two in detail. **[10]**

OR

Q2) a) What is vertical control. Explain the procedure of establishing mean sea level. **[8]**

b) How will test the inter-visibility in geodetic surveying explain the two methods? **[10]**

Q3) a) Correct the observed altitude for the height of signal, curvature and refraction from the following data **[8]**

Observed altitude = $+2^{o}$ 48'39"

Height of instrument = 1.120 m

Height of signal = 4.870 m

Horizontal distant = 5.112 km

Coefficient of refraction = 0.07

(Take R sin 1" = 30.88 m)

P.T.O.

b) Explain various signals used in geodetic surveying with neat sketches. **[8]**

OR

Q4) a) State the types of tape corrections to be applied to the measured length of base line and explain any two in detail. **[8]**

b) The following are the observed values of an angle : **[8]**

Angle	Weight
40^{o} 20' 20"	2
40^{o} 20' 18"	2
40^{o} 20' 19"	3

Find :

i) Probable error of single observation

ii) Probable error of weighted arithmetic mean

iii) Probable error of single observation of weight 3

Q5) a) Explain step by step procedure for figure adjustment of geodetic quadrilateral without central station also explain what is spherical excess. **[8]**

b) Explain method of differences for triangulation adjustments. **[8]**

OR

Q6) a) Explain reciprocal levelling and derive the equation for difference in elevation between two stations in geodetic trigonometric levelling. **[8]**

b) Write a note on correction for curvature and refraction in geodetic surveying. **[8]**

SECTION - II

Q7) a) What do you mean by sounding? What are different purposes of sounding? Enlist different equipment's required for sounding. **[6]**

b) Explain graphical solution to solve three point problem. **[6]**

c) Enlist different tidal gauges. Explain any one with neat sketch. **[4]**

OR

Q8) a) Enlist different methods of locating soundings. Explain any one in detail with neat sketch. **[6]**

b) Explain eco sounding. State its advantages. **[6]**

c) Explain mechanical solution to solve three point problem. **[4]**

Q9) a) Describe with sketches the field work of survey with photo theodolite. Explain how you would plot the survey? **[8]**

b) A tower, lying on a flat area having an average elevation of 800 m above msl, was photographed with a camera having a focal length of 24 cm. The distance between the images of top and bottom of the tower measures 0.34 cm on the photograph. A line AB, 200 m long on the ground, measures 12.2 cm on the same photograph. Determine the height of the tower if the distance of the image of the top of the tower is 8.92 cm, from the principal point. **[10]**

OR

Q10)a) Write short notes on : **[10]**

i) Crab and Drift. ii) Flight planning.

and define principal point and photo nadir

b) Write a note on Radial line method of plotting. **[8]**

Q11)a) Explain how GIS and GPS are useful in flood planning. **[6]**

b) Explain the working principle of Total station. Explain its advantages over 20" transit theodolite. **[6]**

c) Explain any one application of remote sensing in civil engineering. **[4]**

OR

Q12)a) Explain how remote sensing data is useful in disaster management. **[6]**

b) Enlist different special functions of Total station. Explain RDM (Remote Distance Measurement). **[6]**

c) What is active remote sensing and passive remote sensing. **[4]**

■■■

Total No. of Questions : 12]

SEAT No. :

P1576

[Total No. of Pages : 3

[4163] - 62

T.E. (Instrumentation & Control)

SIGNALS & SYSTEMS

(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Define a signal. How they are classified? Explain with the help of neat diagram. **[8]**

b) Determine whether or not each of the following signals are periodic. If a signal is periodic, determine the fundamental period. **[8]**

i) $x(t)=cos\left(t+\frac{\pi}{4}\right)$

ii) $x(n)=\cos\frac{\pi}{3}n+\sin\frac{\pi}{4}n$

OR

Q2) a) How the systems are classified. **[8]**

b) Consider a discrete time system with the input and the output relation, **[8]**
$y[n] = T\{x[n]\} = x^2(n)$.
Determine whether this system is

i) linear and

ii) time invariant.

P.T.O.

Q3) a) Find the inverse Laplace transform of : **[8]**

i) $X(s)=\frac{1}{s(s+1)^2}, \mathrm{Re}(s)>-1$

ii) $X(s)=\frac{s}{s^3+2s^2+9s+18}, \mathrm{Re}(s)>-2$

b) Find the output $y(t)$ of the continuous time LTI system with, **[8]**

$h(t) = e^{-2t}\,u(t)$ for the each of the following inputs,

i) $x(t) = e^{-t}\,u(t)$

ii) $x(t) = e^{-t}\,u(-t)$

OR

Q4) a) Find the z- transform of the following: **[8]**

i) $x(n)=\left\{\frac{1}{2},1,-\frac{1}{3}\right\}$

ii) $x(n) = 2\delta(n+2) - 3\delta(n-2)$

b) Determine the initial and final values of $x(n)$ for each of the following, **[8]**

i) $X(z)=\frac{2z\left(z-\frac{5}{12}\right)}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{3}\right)}$

ii) $X(z)=\frac{z}{2z^2-3z+1}$

Q5) a) Explain in detail the relationship between Laplace transform, z-transform and Fourier transform. **[9]**

b) State and explain the properties of the Fourier transform. **[9]**

OR

Q6) a) State and explain the properties of DTFT. **[9]**

b) Prove the frequency convolution theorem, **[9]**

$$x_1(t)x_2(t) \leftrightarrow \frac{1}{2\pi} X_1(\omega) * X_2(\omega)$$

SECTION - II

Q7) a) Explain the difference between convolution and correlation. **[8]**

b) Find the cross correlation of the following sequences: **[8]**

i) $x(n) = \{1, 2, -\underset{\uparrow}{1}, 1\}$

$h(n) = \{2, \underset{\uparrow}{1}, 0, 0\}$

ii) $x(n) = \{1, -1, -1, 0\}$

$h(n) = \{2, 3, -1, -1\}$

OR

Q8) a) Find the auto correlation for the given sequence using graphical method. **[8]**

i) $x(n) = \{1, -1, 3, 2\}$

ii) $x(n) = \{1, 0, 0, -1\}$

b) List out the various applications of correlation. Explain any one in detail. **[8]**

Q9) a) Distinguish between discrete Random Variables and Continuous Random variables. **[8]**

b) State and explain the properties of the CDF. **[8]**

OR

Q10) a) State and explain the properties of the PDF. **[8]**

b) Define the following terms : **[8]**

i) Mean. ii) Variance.

iii) Moments. iv) Average.

Q11) Write short notes on : **[18]**

a) Pulse Width Modulation.

b) Amplitude Modulation.

OR

Q12) Write short notes on : **[18]**

a) Time Division Multiplexing.

b) Frequency Division Multiplexing.

■■■

Total No. of Questions : 6]

SEAT No. :

P1580

[Total No. of Pages : 2

[4163] - 78
T.E. (Printing)
OFFSET MACHINES - I
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***All questions are compulsory.***

2) ***Answers to two sections should be written in separate books.***

SECTION - I

Q1) Explain the following :

a) How do the blanket cylinders clamps work on offset machine ? **[8]**

b) Explain plate clamping mechanism. **[8]**

OR

Explain 3 cylinder and 5 cylinder type transfer drum system. **[16]**

Q2) Explain :

a) Problems due to rollers inking unit. **[8]**

b) Ink duct and ink keys setting. **[8]**

OR

Explain multiroller type inking system in offset with neat figure and ink path. **[16]**

Q3) Explain use of alcohol, its advantages and limitations. Also explain its relation with surface tension. **[18]**

OR

a) Explain flapper bar and brush type dampening system construction and use. **[9]**

b) List down various constituents of fountain solution. **[9]**

P.T.O.

SECTION - II

Q4) Write short notes on : **[16]**

a) Pile height governor

b) Sensors in feeders

c) Double sheet detector

d) Grippers in delivery system

OR

What is side lay system. Explain with neat diagram. **[16]**

Q5) Explain pre makeready and makeready of a single colour press for a 2 colour job. **[16]**

OR

Explain problems related to machine : **[16]**

i) Glazing of rollers

ii) Lateral slur

iii) Scumming and Tinting

iv) Roller streaks

Q6) a) What is break down maintenance. Write a check list for feeder unit to prevent breakdown. **[9]**

b) Explain any various types of waste generated in press room. **[9]**

OR

Explain ink waste control and paper waste control in press room. **[18]**

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Total No. of Questions : 6]

SEAT No. :

P1581

[Total No. of Pages : 2

[4163] - 79

T.E. (printing)

DIGITAL COLOUR IMAGING AND COLOUR MANAGEMENT

(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer to the two sections should be written in separate books.***

2) ***Neat diagrams must be drawn wherever necessary.***

3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Answer any two : **[18]**

a) Printing is combinations of both additive and subtractive theory-explain.

b) Write and explain various types of Human vision deficiency.

c) Explain and Draw Spectral power distribution graph of D65, D50, A Illuminant and C Illuminant.

Q2) Solve any two : **[16]**

a) Explain the term metamerism.

b) Differentiate Specular Component Excluded and Specular Component Included geometry.

c) Write and explain various types of Spectrophotometer.

Q3) Answer any two : **[16]**

a) Explain the benefits of Device Independent workflow over the Device dependent workflow.

b) Explain CIE color co-ordinates L, a, b, c, h.

c) What is color tolerance ellipse? Explain it for various color spaces.

P.T.O.

SECTION - II

Q4) Solve any two : **[16]**

a) What is Gamut? Explain Gamut Mapping.

b) Explain ICC tags used in ICC profiles.

c) Explain monitor calibration and monitor profiling.

Q5) Answer any two : **[16]**

a) Explain the term 'Device link' used for press standardization.

b) Explain the term 'Conversion' which is one of the C's of colour management.

c) Explain absolute and relative colorimetric rendering intents.

Q6) Answer any two : **[18]**

a) Explain Drum Imagesetter.

b) Explain Digital photography.

c) Explain Image formation in Electrophotography and Ink Jet technology.

■■■

Total No. of Questions : 8]

SEAT No. :

P1582

[Total No. of Pages : 2

[4163] - 93

T.E. (Petroleum Engg.)

DRILLING AND PRODUCTION OPERATIONS

(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question No. 1 and Q. No. 5 are compulsory. Out of the remaining attempt 2 questions from Section - I and 2 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts,electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is differential stuck up? Write reasons, indications and remedy to release. **[8]**

b) Discuss different down hole problems in detail. **[10]**

Q2) a) Discuss rotary system of a drilling rig in brief. **[8]**

b) Calculate gain in mud pit after pumping a slug before pulling out **[8]**

Weight of mud in hole = 11.2 ppg

Weight of slug = 13 ppg

Volume of slug = 5.42 bbl.

Drill pipe capacity = 0.01777 bbl /ft.

Q3) a) Discuss different types of horizontal wells. **[8]**

b) Discuss functions of water base mud in brief. **[4]**

c) Discuss different types of fluid flow & their significance in circulation system. **[4]**

P.T.O.

Q4) Write short notes on : **[16]**

a) Coring

b) Fishing tool "overshot"

c) BOP

d) Marsh funnel

SECTION - II

Q5) Discuss different types of well completions in detail. **[18]**

Q6) a) Explain different types of casing their sizes, grades (API) in brief. **[8]**

b) Discuss the use of : **[8]**

i) Casing float shoe

ii) Casing float collar

iii) Casing centralizer

iv) Bottom plug & Top plug.

Q7) a) What are different types of packer explain hydraulic packer in detail. **[8]**

b) Discuss different workover operations in detail. **[8]**

Q8) Write short note on : **[16]**

a) Well perforation

b) X–MAS tree

c) Blast joint

d) Well head equipment.

■■■

Total No. of Questions : 12]

SEAT No. :

P1686

[Total No. of Pages : 3

[4163] - 22

T.E. (Mechanical) (Mechanical Sandwich)

MANUFACTURING MANAGEMENT

(Sem. - I) (2003 Pattern) (Elective - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you understand by Production? What are various value adding conversion processes involved in production. Explain. **[8]**

b) Describe with suitable examples role of PPC in relation to marketing and finance in manufacturing sector. **[8]**

OR

Q2) a) Define manufacturing management. What are various objectives of it? Explain. **[8]**

b) Explain with example organization structure of job order manufacturing unit and batch production manufacturing unit. **[8]**

Q3) a) Describe various factors to be considered in product design. **[8]**

b) Explain the following. Justify answer with example. **[8]**

i) Fixed cost

ii) Variable cost

OR

Q4) a) How does a good layout influence manufacturing cost? What are the objectives of a good plant lay out? Explain. **[8]**

b) Describe in detail concept of make-buy decision. **[8]**

P.T.O

Q5) a) Why production planning and control is required in industry? Explain main functions of PPC. **[10]**

b) What is Scheduling? Why it is required? What factors should be considered in scheduling. Explain. **[8]**

OR

Q6) Write short note on the following : **[18]**

a) JIT system

b) SMED

c) Capacity planning

SECTION - II

Q7) a) What is sales forecasting? Explain the need for sales forecasting. **[8]**

b) What do you understand by inventory? What are various types of inventory? Explain. **[8]**

OR

Q8) a) Describe following forecasting methods. **[8]**

i) Exponential smoothing.

ii) Time series analysis.

b) Describe concept of Economic order Quantity with suitable example. **[8]**

Q9) a) Bring out the difference between PERT and CPM. **[8]**

b) Explain the following : **[8]**

i) Float, critical path

ii) Crashing of network.

OR

Q10) a) Draw the network, determine the earliest and latest start and finish times of the activities. Identify the critical activities. **[8]**

Activity	1-2	1-4	1-7	2-3	3-5	4-6	4-8	5-6	6-9	7-8	8-9
Duration	2	2	1	4	1	5	8	4	3	3	3

b) Explain the significant information revealed by PERT. **[8]**

Q11) a) Describe in brief role of MIS in manufacturing engineering organization. **[10]**

b) Explain in brief about SAP. **[8]**

OR

Q12) Write short note on the following : **[18]**

a) ERP

b) Supply chain management

c) Role of computer in MIS.

Total No. of Questions : 12]

SEAT No. :

P1687

[Total No. of Pages : 2

[4163] - 24

T.E. (Mech./Mech. S/W)

PLANT ENGINEERING

(Sem. - I) (2003 Pattern) (Elective - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is concept of flow? Explain different types of flow. **[8]**

b) Define layout. How product & process layout are developed. What are their advantages& lines application. **[8]**

OR

Q2) a) What are plant engineering functions. What is importance of location, layout and maintenance? **[8]**

b) Define meteral handling & explain principal of meteral handling. **[8]**

Q3) a) What is PQ analysis and material flow? Explain it. **[8]**

b) What is space requirement analysis and space diagram. **[8]**

OR

Q4) a) Explain: PQRST analysis and RCL chart. **[8]**

b) How to use computer in planning and evolving layouts. **[8]**

Q5) a) What is Cellular layout and mixed layout? Where it is used? **[9]**

b) Explain Concept. **[9]**

i) Unit load

ii) Systematic handing analysis

iii) AGV's

P.T.O

OR

Q6) a) Explain : **[9]**

i) TPM

ii) Repair Cycle analysis

iii) PLC Concept.

b) What is budgeting data collection data analysis and creation of standard data. **[9]**

SECTION - II

Q7) a) Explain what are various safety measures and provisions to be made in case of chemical plants. **[8]**

b) Describe with suitable example capacity estimation for auxiliary services required in plants. **[8]**

OR

Q8) a) State and describe various safety codes involved for industry. **[8]**

b) Explain how you plan for maintenance of industrial equipments. **[8]**

Q9) a) Describe equilibrium theory with regards to work piece control. **[8]**

b) Explain the role of systems engineering in case of plant engineering decisions. **[8]**

OR

Q10) a) Justify with suitable example alternate location theory. **[8]**

b) Describe various constraints involved in systems engineering. **[8]**

Q11) a) Explain role of CRAFT and CORELAP technique **[10]**

b) Describe failure rate and hazard rate on the basis of bathtub curve. **[8]**

OR

Q12) Write short note on the following **[18]**

a) Performance modeling

b) MAPI approach

c) Modelling life cycle

Total No. of Questions : 12]

SEAT No. : ____

P1689

[Total No. of Pages : 7

[4163] - 26

T.E. (Mech./Mech. Sandwich)

THEORY OF MACHINES AND MACHINES DESIGN - II

(2003 Pattern) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with the help of neat sketches the types of cams and followers. **[6]**

b) A four bar mechanism is to be designed by using three precision points, to generate the function $y = x^{1.3}$ for the range $2 \leq x \leq 5$. Assuming 40° starting position and 120° finishing position for the input link and 90° starting position and 180° finishing position of the output link. Find the values of x, y, θ, and ϕ corresponding to three precision points. **[10]**

OR

Q2) a) Explain the following terms related to kinematic synthesis. **[6]**

i) Function generation.

ii) Path generation.

iii) Body guidance.

P.T.O.

b) Draw the profile of a cam operating a roller reciprocating follower having a lift of 40 mm. The roller diameter is 20 mm. The minimum radius of the cam is 30 mm. The cam raises the follower with simple harmonic motion for 110° of its rotation followed by a period of dwell for 80°. The follower descends for the next 120° rotation of the cam with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 120 r.p.m., Calculate the maximum velocity of the follower during ascent period and maximum acceleration of the follower during descent period. **[10]**

Q3) a) Explain the differences between simple, compound and epicyclic gear trains. What are the special advantages of epicyclic gear trains. **[8]**

b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio. **[8]**

OR

Q4) a) State and prove the law of gearing. **[6]**

b) Two shafts A and B are co-axial. A gear C of 50 teeth is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement and find the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110 r.p.m., find the speed of shaft B. **[10]**

Q5) a) Explain with neat sketch centrifugal clutch. Derive an expression for the torque transmitted by the centrifugal clutch. **[8]**

b) A simple band brake is operated by a lever 0.5 m long. The brake drum diameter is 0.5 m and the band encircles five - eight of drum circumference. One end of the band is attached the fulcrum of the lever while the other end of it is attached a point on the lever 100 mm away from fulcrum. Determine the maximum braking torque on the brake drum when an effort of 400 N is applied at the free end of the lever. Take

coefficient of friction as 0.3. Determine also the time required to bring the drum to rest when it is rotating at 600 r.p.m. and all the rotating parts mounted on the drum including the drum have moment of inertia of 180 kg-m^2 and the brake is fully applied. **[10]**

OR

Q6) a) Describe the construction and working of prony brake dynamometer. **[6]**

b) Derive an expression of tension ratio in case of band and block brake in terms of coefficient of friction, block angle of contact and number of blocks in the shoe. **[6]**

c) The thrust on the propeller shaft of marine engine is taken up by 8 collars whose external and internal diameters are 600 mm and 420 mm respectively. The thrust pressure is 0.4 N/m^2 and is uniform. The coefficient of friction between the shaft and the collars is 0.04. If the shaft rotates at 120 r.p.m. Calculate the total axial load and power absorbed in overcoming the friction. **[6]**

SECTION - II

Q7) a) A semi elliptic multi leaf spring is used for the suspension of the rear axle of a truck. It consists of two extra full length leaves and ten graduated length leaves including the master leaf. The centre to centre distance between the spring eyes is 1.2 m. The leaves are made of steel 55 Si2Mo $\underline{90}$ (S_{yt} =1500 N/mm^2 and E = 207000 N/mm^2) and the factor of safety is 2.5. The spring is to be designed for a maximum force of 30 kN. The leaves are pre - stressed so as to equalise stresses in all leaves. Assume a standard width of leaves = 60mm. **[6]**

Determine

i) The cross section of leaves and

ii) The deflection at the end of the spring.

b) In a pair of spur gears, the number of teeth on the pinion and the gear are 20 and 43 respectively. The pinion is made of carbon steel having a ultimate tensile strength of 600 MPa. The pinion is driven by a reversible three phase motor having a working speed of 1440 r.p.m. and 10 kW rating. The gear material has ultimate tensile strength of 400 MPa. The starting torque of motor is twice the working torque. The gear drives the rolling mill. For a standard 20° full depth involute gears, evaluate module and specify the major dimensions of the gears. Specify the hardness of gears.

Take :- Lewis form factor, $Y = 0.484 - \frac{2.85}{Z}$

Factor of safety = 1

Face width, b = 10 module.

pitch line velocity at initially, V = 5 m/s. **[10]**

OR

Q8) a) Explain in detail different types of gear tooth failures with causes and remedies. **[6]**

b) A compressor running at 360 r.p.m. is driven by 150 kW, 1440 r.p.m. motor through a pair of 20° full depth helical gears having helix angle of 23°. The center distance is approximately 435 mm. The number of teeth pinion and gears are 20 and 80 respectively. The permissible bending stress for steel material of pinion is 172 MPa and that of cast steel gear is 155 MPa. Consider a service factor as 1.5 and face width of gear can be taken as 14 times normal module. The combined tooth error in the gears is 0.0406 mm.

i) Calculate the normal module of gears and factor of safety available in bending.

ii) Find the beam strength, dynamic load and wear load.

iii) Specify minimum hardness of gears.

Take, Tooth deformation factor, C = 283.76 N/mm

Lewis form factor, $Y = 0.484 - \frac{2.85}{Z_v}$

Material combination factor, $K = 0.16\left(\frac{BHN}{100}\right)^2$

Dynamic load, $P_d = \frac{21v(ceb\cos^2\psi + p_t)\cos\psi}{21v + \sqrt{(ceb\cos^2\psi + p_t)}}$ **[10]**

Q9) a) A cone clutch is used to connect an electric motor running at 1440 r.p.m. with a machine that is stationary. The machine is equivalent to a rotor of mass 150 kg and radius of gyration as 250 mm. The machine has to be brought to the full speed of 1440 r.p.m. from a stationary condition in 40 seconds. The semicone angle is 12.5°. The mean radius of the clutch is twice the face width. The coefficient of friction is 0.2 and the normal intensity of pressure between contacting surfaces should not exceed 0.1 N/mm^2. Assuming uniform wear criterion, determine. **[12]**

i) The inner and outer diameters.

ii) The face width of friction lining.

iii) The force required to engage the clutch and

iv) The amount of heat generated during each engagement of clutch.

b) A machine is driven by a motor, which exerts a constant torque. The resisting torque of the machine increases uniformly from 500 N-m to 1500 N-m through a 360° rotation of the driving shaft and drops suddenly to 500 N-m again at the beginning of the next revolution. The mean angular velocity of the machine is 30 rad/s and the coefficient of speed fluctuation is 0.2. A solid circular steel disc, 25 mm thick, is used as flywheel. The mass density of steel is 7800 kg/m^3 while poisson's ratio is 0.3. Calculate the outer diameter of the flywheel disc. **[4]**

OR

Q10) a) Treating the rim of rimmed flywheel as a free rotating ring and neglecting the effect of spokes, prove that the tensile stresses in the rim cross section are given by

$$\sigma t = \rho v^2$$

Where, σ_t = tensile stress in rim cross section (N/m^2)

ρ = mass density (kg/m^3)

v = velocity at mean radius (m/s) **[8]**

b) A multi disc clutch has 3 discs on the driving shaft and 2 on driven shaft. The inside diameter of the contact surface is 120 mm. The maximum pressure between the surface is limited to 0.1 N/mm^2. Design the clutch for transmitting 25 kW at 1575 r.p.m. Assume uniform wear condition and coefficient of friction as 0.3. **[8]**

Q11) a) Define static load carrying capacity for ball bearing. Derive the stribeck's equation for static load carrying capacity. **[8]**

b) Following data is given for a hydrostatic thrust bearing

i) Thrust load = 500 kN

ii) Shaft speed = 720 r.p.m.

iii) Shaft diameter = 500 mm

iv) Recess diameter = 300 mm

v) Film thickness = 0.15 mm

vi) Viscosity of lubricant (t) = 160 sus.

vii) Specific gravity = 0.86

Calculate

1) Supply pressure.

2) Flow requirement in litre/sec.

3) Power loss in pumping.

4) Frictional power loss.

Take, Kinematic viscosity, $Z_k = \left(0.22t - \frac{180}{t}\right)$ **[10]**

OR

Q12) a) Explain the construction of hydrodynamic bearing and journal with the help of neat sketches. **[8]**

b) A single - row deep groove ball bearing is subjected to a 30 seconds work cycle that consists of the following parts. **[10]**

	Part I	Part II
Duration (sec)	10	20
Radial load (kN)	45	15
Axial load (kN)	12.5	6.25
Speed (r.p.m)	720	1440

The static and dynamic load capacities of ball bearing are 50 kN and 68 kN respectively. Calculate the expected life of bearing in hours. Refer following table for X and Y factors.

$\left(\frac{F_a}{C_a}\right)$	$\left(\frac{F_a}{F_r}\right) \le e$		$\left(\frac{F_a}{F_r}\right) > e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22
0.040	1	0	0.56	1.8	0.24
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1690

[Total No. of Pages : 3

[4163] - 33

T.E. (Production) (Common with Prod. S/W)

MATERIAL FORMING

(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain hot-forming and cold forming. State the advantages and disadvantages. **[6]**

b) Engineering strains are more convenient than true strains. State true or false. Justify your answer. **[4]**

c) What is formability ? Explain the significance of forming limit diagram with sketch of it. **[6]**

OR

Q2) a) Explain briefly the theories of plastic yielding. **[8]**

b) Explain the effect of temperature, strain rate and friction on metal forming process. **[8]**

Q3) Derive an equation for maximum pressure for axisymmetric forging (Circular disc) considering sticking friction. **[18]**

OR

Q4) a) Explain and differentiate between open die forging and closed die (impression) forging. **[8]**

P.T.O

b) Explain the following operations with neat sketch. **[10]**

i) fullering

ii) edging

iii) blocking

iv) finishing

Q5) a) Explain construction and working of slip stepped cone wire drawing machine and multistage wire drawing machine. Also state its advantages and limitations. **[8]**

b) Explain the preparation of the stock before wire drawing operation. **[8]**

OR

Q6) Derive an equation for the drawing stress σd in tube drawing operation using fixed tapered plug. **[16]**

SECTION - II

Q7) a) Explain the methods used to reduce the separating force in rolling. **[4]**

b) Explain AGC. Discuss the methods of AGC. **[8]**

c) Explain roll camber. **[4]**

OR

Q8) a) Explain various types of series used in roll pass sequence. Give a proper roll pass sequence for angle section. **[8]**

b) Explain 'Sendzimir' mill and 'Planetary mill' with neat sketch. **[8]**

Q9) a) Explain and differentiate between 'Direct' and 'Indirect' extrusion. **[9]**

b) Explain various factors that affect extrusion pressure. **[9]**

OR

Q10) a) Explain different types of dies used for producing hollow sections. **[9]**

b) Derive an equation for workdone in extrusion. **[9]**

Q11) a) Explain the following methods of stretch forming with neat sketch. **[10]**

i) Compression forming.

ii) Radial draw forming.

b) State the advantages of stretch forming. **[6]**

OR

Q12) a) Differentiate between explosive forming and electro hydraulic system. **[6]**

b) Explain manual spinning and power spinning process with neat sketch. **[6]**

c) Explain stretch forming. State the applications. **[4]**

Total No. of Questions : 6] **SEAT No. :**

P1692 **[Total No. of Pages : 4**

[4163] - 40B

T.E. (Production) (Production S/W)

PROCESS PLANNING AND INDUSTRIAL STATISTICS

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

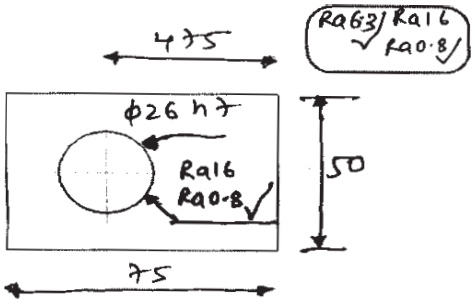
Instructions to the candidates:-

1) ***Answers to two sections must be written in separate answer books.***
2) ***All questions are compulsory.***
3) ***Draw diagrams wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Non - programmable calculator is permitted to be used.***

SECTION - I

Q1) a) Define Process Engineering? List functions of process engineering. **[6]**

b) Carry out part print analysis for following part. **[10]**



Material : C45, No. of parts to be produced :1000 per shift

OR

a) What do you understand by process engineering? How to integrate information from other departments to support Process Engineering Functions. **[6]**

b) "Product Engineering is the pre - function of process engineering". Discuss. **[10]**

Q2) Explain following with suitable example. **[16]**

a) Principal Process Operations.

b) Basic Process Operations.

c) Auxiliary Process Operations.

OR

P.T.O.

For the component shown in fig. 5.23 to be manufactured by using standard lathe machine, explain following : **[16]**

a) Locating Area.

b) Supporting Area.

c) Holding Area.

for chamfering operation, step turning operation. Explain how will you achieve location control, mechanical control and geometric control for the above component during machining.

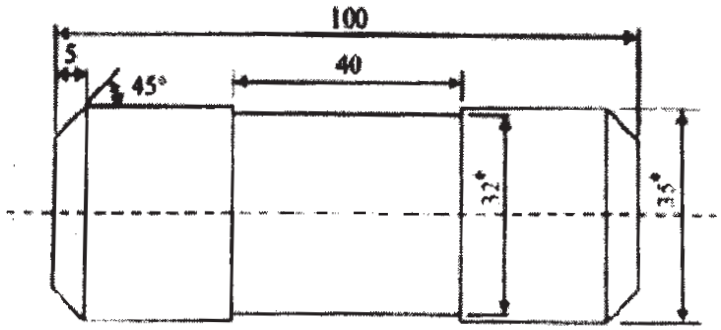
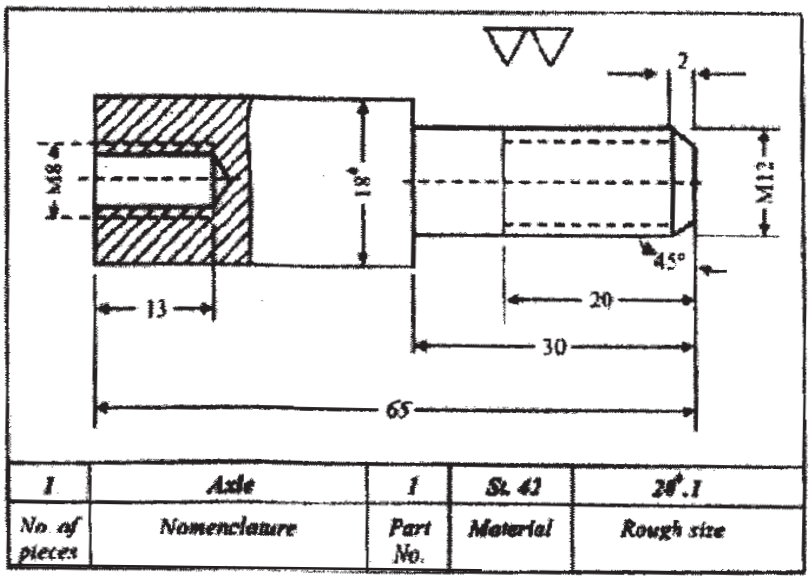


Fig. 5.23

Q3) Prepare a process plan for a component to be produced by using standard lathe machine as shown in fig. 2.5. **[18]**

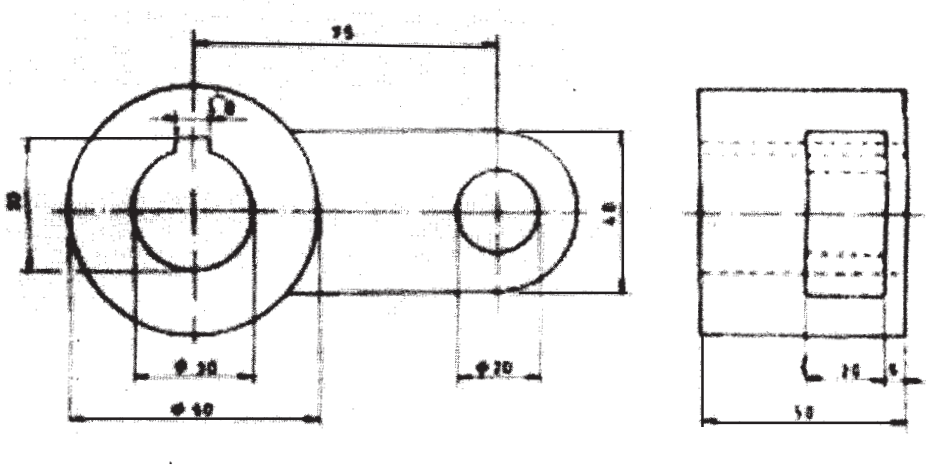


1	Axle	1	St. 42	28.1
No. of pieces	Nomenclature	Part No.	Material	Rough size

Fig. 2.5. Component drawing of an "Axle"

OR

For a operating arm as shown in following figure a keyway is required to be produced by milling process. **[18]**



Prepare a process plan.

SECTION - II

Q4) a) What is the purpose and utilization of Tolerance Charts? **[8]**

b) What are the three basic methods by which surface roughness is measured? Explain. **[8]**

OR

Explain with suitable example how tolerance stacking is carried out. **[16]**

Q5) a) Discuss various methods of collecting Primary data. **[8]**

b) From the following data obtain the two regression equations. **[8]**

Sales	91	97	108	121	67	124	51	73	111	57
Purchase	71	75	69	97	70	91	39	61	80	47

OR

Explain any two of following **[16]**

a) X bar and R chart.

b) P chart.

c) np chart.

Q6) a) What is meant by hypothesis? Explain the applications of Chi - square test. **[12]**

b) Explain following **[6]**

i) Standard Deviation.

ii) Statistical Mean.

iii) Mode.

iv) Median.

OR

Explain in brief **any three** of the following : **[18]**

a) Control chart for variables and attributes.

b) OC curve.

c) Procedure of testing hypothesis.

d) AQL and LTPD

e) Measure of central tendency.

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1694

[Total No. of Pages : 3

[4163] - 74

T.E. (Printing)

DESIGN OF PRINTING MACHINE COMPONENTS

(Sem. - I) (2003 Pattern)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer 3 questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Use of calculator is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the procedure to design eccentrically loaded bolted joints with example. **[8]**

b) What are important considerations in selection of material in design. **[8]**

OR

Q2) a) Define fits, state different types of fits. What is difference between hole basis and shaft basis system of specifying fits. **[8]**

b) Explain importance of geometric tolerance and method to specify them on machine component drawing. **[8]**

Q3) a) Explain the step by step procedure of design of coffer joint. **[8]**

b) State the procedure of designing shaft as per following approach

i) ASME code ii) Stiffness approach. **[8]**

OR

Q4) a) Design the bell crank lever. **[8]**

b) State the procedure of designing shaft as per the following approaches. **[8]**

i) Equivalent bending moment approach.

ii) Rigidity approach.

P.T.O

Q5) a) Compare bolted joint with welded joints. **[8]**

b) What is the different between properties of brittle and ductile materials? State at least two engineering applications of brittle and ductile materials. **[10]**

OR

Q6) a) Explain the procedure of selecting a type of fit using at least three examples. **[10]**

b) What are important consideration in selection of material in design. **[8]**

SECTION - II

Q7) a) Sketch Flexible Protective Flange coupling. Show all the dimentions in terms of shaft diameter. **[8]**

b) A Flange coupling is to transmit 5kW at 1000 rpm between the aligned shaft. Design the coupling. Assume your own material & stresses. **[8]**

OR

Q8) a) A square key is equally strong in crushing and shear. Derive the relation between stresses. **[8]**

b) Explain the important factors in selecting a coupling. **[8]**

Q9) a) Prove that maximum efficiency of square threaded screw can be given by. **[8]**

$$\eta_{max} = \frac{1-\sin\theta}{1+\sin\theta}$$

where, θ is pressure angle.

b) What are the different types of stresses induced in power screw. **[8]**

OR

Q10) Design a screw jack for lifting a load of 50 kN through a height of 0.4m. The screw is made of steel and nut of bronze. Sketch the front sectional view. The following allowable stresses are used for steel : - **[16]**

Compressive stress = 80 MPa,

Shear stress = 45 MPa.

Q11) a) Derive the load-stress equation of Helical spring. **[8]**

b) A mechanism used in printing machinery consists of tension spring assembled with a preload of 30 N. The wire diameter of spring is 2mm with a spring index of 6. The spring has 18 active coils. The spring wire is not drawn and oil tempered having following material properties. **[10]**

i) Design shear stress = 680 N/mm^2.

ii) Modulus of rigidity = 8×10^4 N/mm^2.

Determine

1) The initial shear stress in the wire.

2) The spring rate and

3) The maximum force the spring can take.

OR

Q12) a) Derive the relation for deflection of Helical torsion spring. **[8]**

b) Design a spring for balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be enclosed in a casing of 25mm diameter. The approximate number of turns is 30. The modulus of rigidity 85 kN/mm^2. Also calculate the maximum shear stress induced. **[10]**

Total No. of Questions : 6]

SEAT No. :

P1695

[Total No. of Pages : 2

[4163] - 75

T.E. (Printing)

TECHNOLOGY OF PRINT FINISHING AND PACKAGING

(2003 Pattern) (Sem. -I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer all questions beginning on a new page.***
2) ***Answer 1 of each a or b.***
3) ***Question 1, 2, 4 & 5 carry 16 marks each. Questions 3 and 6 carry 18 marks.***

SECTION - I

Q1) a) What is Print Finishing and what processes are included therein. Explain at least one process in detail.

b) Explain -

Manufacture of a full bound book.

Q2) a) Explain the working of a simple nipping press with suitable diagram?

b) What do you understand under ISO/DIN Paper sizes. What is the constant relation of the sides of the paper? Tabulate the A series of papers from A0 to A6.

Q3) Explain the various types of Bindings. With suitable diagrams?

SECTION - II

Q4) a) What do you understand under packaging and its purpose?

b) What are the types of packaging that are related to the printing industry?

P.T.O

Q5) a) Calculate the pressure required for a punching die having a total cutting area of 180 running inches and total creasing area of 120 running inches? I running inch required 40 kg pressure.

b) What are the further finishing / add on processes involved in manufacture of cartons such as embossing etc.

Q6) a) What are the basic substrates used for flexible packaging? Give details of processing of Duplex Board for manufacture of a carton.

b) Design a carton having the following dimensions

Width 12" Breadth 3.5" and height of 10" The carton to have the opening on the side.

Total No. of Questions : 8]

SEAT No. :

P1696

[Total No. of Pages : 2

[4163] - 95

T.E. (Petroleum)

PETROLEUM FIELD INSTRUMENTATION AND CONTROL

(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Attempt any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculators is allowed.***
4) ***Draw neat sketch wherever necessary.***

SECTION - I

Q1) a) What do you understand by the term calibration of an instrument? Why it is necessary? How it is carried out? State sources of errors. Explain with suitable example. **[8]**

b) Explain the term fidelity, dynamic error, speed of response and measurement lag. **[4]**

c) Classify and define the characteristics of an instrument with respect to its accuracy. **[4]**

Q2) a) Describe in brief the International Temperature scale. Describe in detail the selection of thermocouples, based on the use of thermocouple tables. **[7]**

b) Explain the Classification of flowmeters. Explain how will you use the area type flow meter if its working fluid is changed. **[8]**

c) Give the classification of Pressure measuring instruments. **[3]**

Q3) a) List various level measuring instruments. Explain anyone instrument in detail used in Petroleum field application. **[6]**

b) Explain anyone method for measurement of vacuum. **[4]**

c) Explain the working of Electro-pneumatic converter with proper sketch. **[6]**

P.T.O

Q4) a) Explain the Instrumentation involved in oil and gas gathering station. **[6]**

b) Describe with proper sketch the symbols used in instrumentation diagram. **[6]**

c) How will you measure Temperature of oil wells? **[4]**

SECTION - II

Q5) a) Explain the significance of having a "system approach" in process control. Give example to justify your answer. **[6]**

b) Why is it necessary to define the order of the system with respect to process control. **[6]**

c) Explain with utility, different hardware components of a simple feedback loop. **[6]**

Q6) a) Explain the role of different control modes giving their characteristic response following a step change, with proper sketch. **[8]**

b) Distinguish between Feedback and Feedforward control action. How is Cascade control scheme different from these two control schemes. **[8]**

Q7) a) Explain how Programmable Logic Controller can be used in gas-oil-water separator unit. **[10]**

b) Explain what is controller tuning? Give the procedure of control tuning. **[6]**

Q8) a) Explain different components in SCADA system. Give its application in Petroleum industry. **[8]**

b) Write a short note on shell and tube heat exchanger control with proper diagram. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1697

[Total No. of Pages : 1

[4163] - 97

T.E. (Petroleum Engineering)

PROPERTIES OF RESERVOIR ROCKS AND FLUIDS

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Attempt three questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non - programmable calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) Derive the linear flow equation for turbulent gas flow. **[18]**

Q2) Write an essay on stress on rock properties. **[16]**

Q3) Define Rs, Bo, co, μo, Bg, μg, cg, Bw, cw and explain each with a variation in pressure. Explain how each is experimentally calculated. **[16]**

Q4) a) Define porosity and He porosimeter. **[6]**

b) Write a note on two phase relative permeability. **[5]**

c) Derive an expression for liquid flow in layered porous media. **[5]**

SECTION - II

Q5) Draw a phase diagram for a crude oil and explain in detail. **[16]**

Q6) a) What are K values? Explain. **[8]**

b) Explain in detail how a flash calculation is done. **[8]**

Q7) a) Derive the Laplace's equation and explain its significance. **[9]**

b) Explain one method to measure relative permeability. **[9]**

Q8) Derive the Sauve EOS in terms of Z. What is Zv and Zl. **[16]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1698

[Total No. of Pages : 2

[4163] - 98
T.E. (Petroleum)
PETROLEUM PRODUCTION ENGINEERING - I
(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer Q.No. 1 or 2, Q.3 or 4, Q.No.5 or 6 from Section - I and Q.No. 7 or 8, Q.No. 9 or 10. Q.No. 11 or 12 from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, calculator is allowed,***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Define and explain all the PVT properties with the help of graph. **[18]**

OR

Q2) a) State and explain Vogel and Fetkovich correlation used to construct IPR curve. **[9]**

b) Draw and explain the generic nature of graph for PI, GOR and pressure against time or for a water and gas cap drive reservoir. **[9]**

Q3) a) What is the meaning of single phase, two phase, and three phase flow explain. **[6]**

b) Discuss in detail vertical lift performance. **[10]**

OR

Q4) a) Explain critical and sub critical flow through chokes. **[8]**

b) What is the difference between PI and specific PI? Write the unit of it. Draw the relevant graphs and explain the concept of IPR. **[8]**

Q5) a) Describe in detail any one mathematical model of well fracturing. **[10]**

b) Draw the sketch of a typical fracture geometry and explain all the specifications of it. **[6]**

OR

Q6) a) What is Matrix Acidization job? Describe the necessary elements and the general design considerations to accomplish a Matix Acidization job.**[10]**

b) State and explain equations to calculate pressure drop because of formation damage. **[6]**

P.T.O.

SECTION - II

Q7) Write short notes on the following. **[18]**

a) Workover problems of gas well.

b) Water and gas shut off job.

c) Gravel pack completion.

d) Well productivity.

OR

Q8) a) How will you design a workover job for sand control problem in a vertical well? Explain. **[12]**

b) Discuss the production advantages of Horizontal Well Technology. **[6]**

Q9) a) Design a two phase vertical separator using the following data : **[10]**

Gas flow rate (Qg) = 11 MMscf/day

Oil flow rate (Qo) = 2100 bbls/day for 42°API

Operating Pressure = 980 psia.

Operating Temperature = 60°F

Specific Gravity of Gas = 0.6

Gas Compressibility = Z = 0.83

From graph, value of k = 0.284 (Constant based on liquid gas properties)

Liquid drop to be separated = dm = 100 micron.

Assume slenderness ratio of 3 & 4. Retention time 2, 2.5, & 3 minutes.

b) Discuss the mechanism of oil and gas separation used in three phase horizontal oil and gas separator. **[6]**

OR

Q10) a) Draw the neat schematic sketch and explain the principle of operation and working of any one emulsion treating equipment used in the oil and gas processing facility. **[12]**

b) Explain, 'inlet diverter' in brief. **[4]**

Q11) a) Write a note on Safety at oil and gas production facility. **[8]**

b) Discuss the process flow diagram of Group Gathering Station. **[8]**

OR

Q12) Explain the following **[16]**

a) Central processing facility.

b) Heater treater.

c) Skimmer tank.

d) Demulsification.

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Total No. of Questions : 6]

SEAT No. :

P1700

[Total No. of Pages : 3

[4163] - 105

T.E. (Petrochemical Engineering)

PROCESS AND ANALYSIS INSTRUMENTATION

(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Attempt Q1a or b, Q2a or b, Q3a or b, Q4a or b, Q5a or b, Q6a or b,***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculators steam table is allowed.***
4) ***Draw neat sketch wherever necessary.***

SECTION - I

Q1) a) i) Explain the various process lags with example **[6]**

ii) Explain the importance of the valve positioner in control valves **[6]**

iii) Explain the various components of SCAD A **[6]**

OR

b) i) Explain the various sealing techniques in pressure gauges. **[6]**

ii) What are the factors to be considered while selecting a control valve? **[6]**

iii) Explain servo and regulator control. **[6]**

Q2) a) i) Explain the types of measurement uncertainties in detail **[8]**

ii) Define: Accuracy, Precision, Repeatability, Reproducibility, Hysterisis, Drift, Fidelity, Dead zone. **[8]**

OR

b) i) Give the classification of the measuring instruments. **[8]**

ii) What is Strouhal number? Describe a flow meter using the same. **[8]**

P.T.O

Q3) a) i) Write a note on the Resistance Temperature Detectors (RTD). **[8]**

ii) Explain pressure measurement using enlarged leg manometer. **[8]**

OR

b) i) Explain the various hydrostatic pressure methods for level measurement **[8]**

ii) A venturimeter with throat diameter 0.065m and coefficient of discharge 0.95 is used to calibrate a pitot static tube. Air flows through a 110mm diameter pipe in which the venturi is fitted. The difference in water level in the manometer attached to the venturi is 50 mm. The pitot static tube is placed at the downstream of the venturi. Water manometer attached to it shows a reading of 7 mm. Calculate the flow rate through the pipe and the coefficient of velocity of the pitot tube. Assume the density of air as 1.13 kg/m^3 and that of water as 100 kg/m^3 **[8]**

SECTION II

Q4) a) i) Describe the various sampling techniques. **[8]**

ii) Write a note on HPLC. **[8]**

OR

b) i) Classify analysis instruments. **[8]**

ii) Write a note on NMR spectroscopy. **[8]**

Q5) a) i) Zirconia cells are now frequently used as oxygen analysis cells, specially in power plants. Describe this method of analysis. **[8]**

ii) Explain the method of analysis using thermal conductivity. **[8]**

OR

b) i) Discuss CO analyzer. **[8]**

ii) Write a note on the mass spectrometer. **[8]**

Q6) a) i) Differentiate between turbidity meter and nephelometer. **[6]**

ii) Describe the principle of FTIR and hence describe IR spectroscopy. **[6]**

iii) Discuss Orsat analysis. **[6]**

OR

b) i) Explain composition analysis using refractive index method. **[6]**

ii) Describe in brief pH measurement. **[6]**

iii) Discuss the various methods of density measurement. **[6]**

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Total No. of Questions : 12]

SEAT No. : ____

P1704

[Total No. of Pages : 2

[4163] - 117
T.E. (Polymer Engineering)
POLYMER MATERIALS - II
(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Give a typical formulation of phenolic resin and additives involved in it. **[9]**

b) Give the compounding and applications of polyester resin. **[8]**

OR

Q2) a) Enlist the properties of cured epoxy resins. Correlate the applications with properties. **[9]**

b) What are amino resins? Give the formulation for any one type of amino resin. **[8]**

Q3) a) Discuss synthesis, properties and applications of silicone resins. **[9]**

b) Write a note on properties and applications of polyimide resin. **[8]**

OR

Q4) a) Based on properties of polyimide resins prove that it is high performance polymeric resin. **[9]**

b) Give the curing reactions for allyl and silicone resins. **[8]**

Q5) a) Define paint. How is paint prepared? Mention various additives and their role. **[8]**

b) What is adhesion? Explain the mechanism of adhesion and structural requirements of polymer to show adhesive properties. **[8]**

OR

Q6) a) What is primer? Explain the importance of the same. **[8]**

b) Give two examples each of solvent, plastisizer, hardner and thickening agent used in adhesives. **[8]**

P.T.O.

SECTION - II

Q7) a) Discuss the manufacture process of rubber from latex. **[9]**

b) Explain basic terminologies - raw rubber & vulcunizate. **[8]**

OR

Q8) a) Discuss how molecular structures of elastomers are different from usual polymers. **[9]**

b) Explain how mastication affects polymer molecular weight? Discuss various compounding processes for raw rubber. **[8]**

Q9) Write a note on :

a) Tackifiers. **[9]**

b) Antiozonents. **[8]**

OR

Q10) Write a note :

a) Reinforcement by chords and fabrics. **[9]**

b) Particulate C black. **[8]**

Q11) a) Give the manufacture, properties and applications of acrylic rubber. **[8]**

b) Discuss thermoplastic elastomers. How do they work? **[8]**

OR

Q12) a) Differentiate nitrile and butyl rubber. **[8]**

b) Write a note on **[8]**

i) SBR.

ii) Fluoro rubber.

♦♦♦♦

Total No. of Questions : 12]

P1757

SEAT No. : ____

[Total No. of Pages : 3

[4163] - 40A
T.E. (Production) (Production S/W)
MANUFACTURING ENGINEERING TECHNOLOGY
(2003 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Discuss the method of obtaining criticality of a component or sub-system using Risk Priority Number. **[9]**

b) Draw and explain various symbols used in Fault Tree Analysis. Explain the procedure to evaluate overall failure rate. **[9]**

OR

Q2) a) What is TQM? Describe internal and External customer and supplier link conception TQM. **[9]**

b) Differentiate between : **[9]**

i) Inspection and quality control.

ii) Cost of quality and value of quality.

Q3) Explain the following : **[16]**

a) 'Poke Yoke'.

b) Six-sigma.

c) Zero defect

d) QFD

OR

Q4) Discuss the metrological properties of measuring instruments. **[16]**

P.T.O.

Q5) a) Explain how Just-in Time (JIT) system is used in mass production organization. **[8]**

b) Explain the basic concept of World Class Manufacturing. **[8]**

OR

Q6) Write short notes on any three : **[16]**

a) Pareto Analysis.

b) Scatter diagram.

c) Fish bone Diagram.

d) Electrical Comparators.

SECTION - II

Q7) a) Explain the process of manufacturing of slip gauges. **[9]**

b) Differentiate between : **[9]**

i) Accuracy and precision.

ii) Line and end standards.

iii) Gauges and comparators.

OR

Q8) a) Explain with neat sketch the sigma comparator. **[9]**

b) Write a short note on Parkinson gear tester. **[9]**

Q9) Write short notes on : **[16]**

a) Three wire method.

b) Thread cursors and their effects.

c) Auto collimeter.

OR

Q10)a) For 20° pressure angle gear having 40 teeth and 4 mm module, calculate diameter of plug which fits in tooth space with its center on pitch circle and distance over the plug in opposite tooth space. **[8]**

b) Explain Tool makers microscope. **[8]**

Q11) Write short notes on : **[16]**

a) CMM

b) CNC performance test.

c) Surface plates.

OR

Q12) a) Explain the principles of alignment tests. Discuss any three alignment tests on lathe machine. **[8]**

b) Define flatness. Explain with neat sketch flatness testing methods. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P1768

[Total No. of Pages : 2

[4163] - 70
T.E. (Instru. & Control)
INDUSTRIAL MANAGEMENT
(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define management. Explain various functions of management. Explain the role of an entrepreneur in a changing business environment. **[10]**

b) State and explain the concept of business process Re - engineering and its contribution to business development. **[8]**

OR

Q2) a) Explain the following concepts. **[12]**

i) Balanced score card.

ii) Mind Mapping.

iii) Ishikawa diagram.

b) Write a short note on Functional organisation. **[6]**

Q3) Define strategic management. How mergers and take - overs considered as a potential business strategy in a liberalised market? Explain. **[16]**

OR

Q4) Briefly explain the following : **[16]**

a) WTO & International Trade.

b) Patent & Copy Right.

c) ISO - 9000 Series.

Q5) Define Inventory Control with its objectives and importance. Explain quantitative technique with EOQ model. How Economic Order Quantity (EOQ) is derived? **[16]**

OR

P.T.O.

Q6) State and explain the objectives, functions and Techniques of production planning and production control. **[16]**

SECTION - II

Q7) a) Define Motivation. Explain Need heirarchy theory of motivation propounded by Maslow. **[9]**

b) What is Leadership? Explain contingency theory of leadership. **[9]**

OR

Q8) a) State and explain various methods of training imparted to workers. **[9]**

b) Define man power planning. Briefly explain the objectives and functions of manpower planning. **[9]**

Q9) What is capital structure? Explain various sources of working capital and problems associated with working capital management in a process industry. **[16]**

OR

Q10) a) Define capital Budgeting. Explain any two methods of capital budgeting. **[8]**

b) Explain the following : **[8]**

i) Letter of credit.

ii) Types of project costs.

Q11) State and explain the salient features of Factory Act, 1948 and company Act, 1956. **[16]**

OR

Q12) Write short notes : **[16]**

a) Types of Inspection.

b) Sources of Finance to business enterprises.

c) Value added tax.

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P1790

[Total No. of Pages : 3

[4163] - 36

T.E. (Production)

MACHINES TOOLS AND ADVANCE MANUFACTURING SYSTEMS

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***From Section - I, solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6. and from Section - II, solve Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

SECTION - I

Unit - I

Q1) Referring Fig. No. 1, design the set of plate types of cams for a single spindle automat machine. Assume suitable data of machining parameters for mild steel material. The bar stock is Φ 30 × 65 and 200 pieces are to be manufactured. Also draw the layout for turret cam. **[18]**

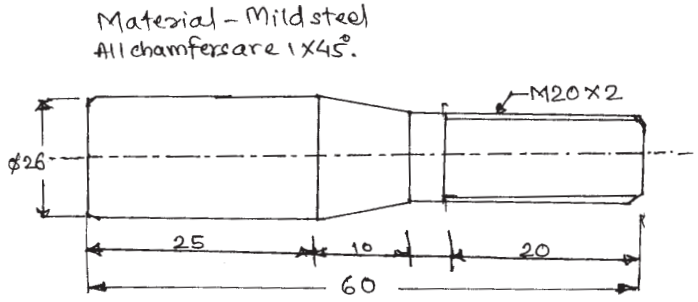

Fig. No. 1 Gauge.
All dimentions are in mm.

OR

Q2) a) Classify single spindle automatic machine and explain with sketch single spindle automatic machine. **[9]**

b) Explain parallel and progressive action multi - spindle machine with neat sketches. **[9]**

Unit - II

Q3) a) How NC/CNC machines are classified with different considerations? Explain with a neat block diagram CNC and DNC machines. **[8]**

P.T.O.

b) Explain the different systems employed on CNC machines for enhancement of productive machine. **[8]**

OR

Q4) a) Explain with a neat sketches, open loop and closed loop control systems. Explain the advantages of closed loop systems over open loop systems. **[8]**

b) Explain the axis identification employed on CNC machine tools for primary, secondary and tertiary axes. Discuss absolute and incremental co-ordinate system. **[8]**

Unit - III

Q5) a) Explain the reasons for applying surface coating on the material. Give different steps followed in a powder coating process. **[8]**

b) Write a short note on : **[8]**

i) Nano machining

ii) Micro machining.

OR

Q6) Write SHORT NOTES **[16]**

a) Chemical vapour deposition.

b) Phosphating.

c) Galvanizing.

d) Ion - implantation.

SECTION - II

Unit - IV

Q7) a) Describe with a sketch any three types of rotary transfer mechanisms. **[6]**

b) Discuss any two methods of balancing a transfer line. **[6]**

c) In a six station Geneva mechanism, the driver rotates at 3 rpm. Determine the cycle time of indexing mechanism, the process time and the time spent by each cycle in indexing the table to the next working position. **[6]**

OR

Q8) a) The precedence relationships and element times for assembling a new model of product is given in the table below. The ideal cycle time is 0.53min. **[10]**

Work element	1	2	3	4	5	6	7	8	9	10	11
Te (min.)	0.32	0.10	0.20	0.05	0.10	0.23	0.20	0.05	0.32	0.10	0.30
Predecessor	–	–	1, 2	2	4	3	6	6	5, 7,	8, 9	10

i) Construct precedence diagram.

ii) By using largest candidate rule assign work element to stations. Compute balance delay.

b) Explain the offline and online inspection methods employed on any machine tools. **[4]**

c) Give a classification of automated material handling equipments. **[4]**

Unit - V

Q9) a) What is difference between fixed automation, programmable automation and flexible automation? **[8]**

b) What is Product Flow Analysis? Explain in detail. **[8]**

OR

Q10) a) Classify robots on the basis of configuration. Explain the robot volume and degree of freedom. **[8]**

b) What is cellular manufacturing system? Explain with an appropriate example, how it overcomes the shortcomings of functional layout. **[8]**

Unit - VI

Q11) a) Describe the factors which affects the quality and performance of CNC machines. **[8]**

b) What is adaptive control? Explain with sketch, the adaptive control used in CNC machine. **[8]**

OR

Q12) a) How control systems are classified? Explain pre selective control system used in machine tools. **[8]**

b) Discuss preventive and breakdown maintenance. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P954

[Total No. of Pages : 4

[4163] - 2

T.E. (Civil)

FLUID MECHANICS - II

(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain function, location and type of surge tank. **[6]**

b) Derive an expression for rise in pressure due to sudden closure of valve in elastic pipe. **[6]**

c) Water flows in a pressure pipe at 3.2 m/s which is 2.5 km long. Due to sudden complete closure the velocity of pressure wave travelling was found to be 800 m/s, find **[4]**

i) Maximum pressure rise.

ii) Period of oscillation neglect friction loss.

d) What is unsteady flow? How is it different from other types of flow. **[2]**

OR

Q2) a) Distinguish between **[8]**

i) Submerged & bluff body

ii) Skin friction & form drag.

iii) Profile & deformation drag.

iv) Circulation & lift.

b) The wing of an aircraft is rectangle in plan & has an Chord of 1.2 m & span of 15 m. An aerodynamic force of 25 kN is generated when aircraft moves at 180 kmph. The lift - drag ratio is found to be 7.5, find **[6]**

i) Coefficient of lift & drag.

ii) Total weight carried by aircraft.

iii) Power required for flight.

c) Explain how an aerofoil develops boundary circulation and lift. **[4]**

P.T.O.

Q3) a) Show that for a moving curved vare the efficiency is maximum at $\frac{8}{27}(1+\cos\theta)$ when jet strikes the vane at its centre. **[6]**

b) A jet of water of diameter 10 cms strike a curved vane at its centre, with a velocity of 25 m/s. The curved plate is moving with velocity of 10 m/s, in the direction of jet. The jet is deflected through an angle of 165°. Assuming the plate smooth, find

i) Force exerted on plate in direction of jet.

ii) Power of jet.

iii) Efficiency of jet. **[6]**

c) A fluid jet striking a normal fixed plate exerts a force of 15 N on the plate. If the same jet strikes a fixed curved vane & gets deflected through 140°, what is the force exerted on vane. **[4]**

OR

Q4) a) Give complete classification of hydraulic turbine. **[6]**

b) Design a Francis turbine runner with following data
Net head = 70m, speed N = 350 rpm, output power 350 kw, Hydraulic efficiency = 95%, overall efficiency = 85%, flow ratio $\phi = 0.15$, breadth ratio n = 0.1, inner diameter is ½ outer diameter. Assume 6% of circumferential area of runner is occupied by thicknen of vane. Velocity of flow remain constant through out & flow is radial at exit. **[6]**

c) Draw main characteristic curve for Pelton turbine for **[4]**

i) unit discharge.

ii) unit power.

Q5) a) With help of velocity triangle derive equation for theoretical power developed & hydraulic efficiency for Pelton turbine. **[6]**

b) The quantity of water available for a hydroelectric station is 300 m^3/s under a head of 20 m. Considering the speed of turbine 375 rpm, efficiency 82%. Determine the least number of machines all of same size that will be needed if

i) When Francis turbine whose N_s must not exceed 350,

ii) Kaplan turbine whose N_s must not exceed 550. Find the individual output of units in the two cases. **[6]**

c) Explain cavitation in turbines, measures to control cavitation. **[4]**

OR

Q6) a) Derive an expression for specific speed of a centrifugal pump. **[6]**

b) Compare Reciprocating & Centrifugal Pump. **[4]**

c) A pump discharges a liquid of spgr 1.2, to an total head of 10 m, at a rate of 120 LPs when running at a speed of 1000 rpm. The diameter & width at outlet are 25cm & 5cm respectively. The pump develops a shaft power of 20 kW, vane angle at outlet = 35°, Calculate the

i) Manometric &

ii) Overall efficiency. Also state the type of impeller. **[6]**

SECTION - II

Q7) a) Define the following geometric elements of an open channel. **[4]**

i) Prismatic channel.

ii) Welted area.

iii) Depth of flow.

iv) Hydraulic radius.

b) Derive the formula for the most efficient rectangular channel section. **[6]**

c) A rectangular channel 5.0 m wide has a normal depth of flow 0.5 m. The channel bed slope is 1 in 250, Manning's roughness coefficient n = 0.012.

Determine **[8]**

i) Discharge per 'm' width.

ii) Specific energy & specific force.

iii) Minimum specific energy for sustaining the above discharge.

iv) Maximum discharge that can be carried, based on the energy of present flow.

OR

Q8) a) Explain - velocity distribution in an open channel flow. **[4]**

b) Find rate of flow & conveyance for a rectangular channel 7m wide for uniform flow at a depth of 2m. Channel bed slope is 1 in 1500. Take Chezy's constant C = 60. **[6]**

c) Define - most efficient channel section & derive the formula for most efficient triangular section. **[8]**

Q9) a) With usual notations, prove the equation, **[8]**

$$\frac{y_2}{y_1} = \frac{1}{2}(-1+\sqrt{1+8Fr_1^2})$$

b) A hydraulic jump type energy dissipater is designed to have energy loss of 3 m. When Froude number before jump is 10. Estimate the sequent depth of flow, discharge & Froude No. after jump. **[8]**

OR

Q10) a) Write short notes on : **[9]**

i) Standing wave flame.

ii) Specific Energy diagram.

iii) Critical flow.

b) A discharge of 20 m^3/s flows in a 10 m wide rectangular channel under critical condition. Find depth & specific energy corresponding to this condition. Take n = 0.015. Also find critical slope. **[7]**

Q11) a) Derive the dynamic equation of a gradually varied flow profile. **[9]**

$$\frac{dy}{dx} = \frac{S_o - S_f}{1 - Fr^2}$$

b) Explain a control section & its significance in GVF computations. **[7]**

OR

Q12) a) Explain Ven Te Chow method of GVF profile computation. **[6]**

b) A rectangular channel 20m wide flows with a normal depth of 2m, bed slope 1 in 6000. At a certain section, the depth of flow is 3m. How far u/s or d/s of this section will the depth be 2.5 m? Take n = 0.015. Use step method & take two steps. **[10]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P955

[Total No. of Pages : 7

[4163] - 8

T.E. (Civil)

STRUCTURAL DESIGN - II

(2003 Pattern) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4 in section I.***
2) ***Answer Q.5 or Q.6, Q.7 or Q.8 in section II.***
3) ***Answers to two sections should be written in separate books.***
4) ***Figures to the right indicate full marks.***
5) ***Use of IS-456-2000 and non-programmable calculator is allowed.***
6) ***Neat diagrams must be drawn wherever necessary.***
7) ***More reproduction from IS code as answer will not be given full credit.***
8) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Answer the following: **[9]**

i) What do you mean by singly R.C. section and doubly R.C. section.

ii) Under what circumstances doubly R.C. sectors are considered.

iii) What are the various advantages of doubly R.C. section.

b) Derive the expression for neutral axis depth for singly reinforced rectangular balanced section in limit state method.

Show that the limiting depth of N-A for balanced rectangular cross - section reinforced with Fe250, Fe 415, and Fe500 grade of steel is 0.53d, 0.48d and 0.46d. respectively. **[8]**

c) A simply supported beam of size 230mm wide and 564mm effective depth is reinforced with 4 number 12mm diameter bars. The span of the beam is 4m.

Find :

i) Depth of neutral axis.

ii) Types of section.

P.T.O.

iii) Moment of resistance.

iv) Uniformly distributed load on beam in addition to its self weight.

Use Materials : M20 grade concrete.

Fe415 grade reinforcement

W.S.M. is recommanded **[8]**

OR

Q2) a) Answer the following : **[9]**

i) Why is an over - reinforced design not preferred?

ii) What is a balanced design?

iii) Define effective depth, depth of neutral axis, and lever arm.

b) A rectangular beam 230mm wide × 400mm effective depth is subjected to moment of 55 kN.M. The effective cover to compressive reinforcement is 40mm. Find out reinforcing steel.

Materials : - M20 grade concrete and mild steel reinforcement.

Method : W.S.M. **[8]**

c) A Tee beam has following details. **[8]**

Effective flange width = 1200mm.

Thickness of slab = 100mm

Width of rib = 300mm.

Effective depth = 560mm.

Tension reinforcement = 4 No. 25mm.

Calculate factored moment of resistance.

Materials : M20 grade concrete.

Fe415 type reinforcement.

Method : L.S.M.

Q3) a) What do you understand by "redistribution of moments" as applied to R.C. structure? What are its advantages? **[6]**

b) What are the various reasons for providing minimum shear reinforcement? **[4]**

c) Obtain design moments envelope after 30% redistribution of moments for a two span continuous beam ABC freely supported at A and C and continuous over the central support B. **[15]**

AB = BC = 4

D.L.(inclusive of self wt.) = 20 kN/m.

Imposed load = 28 kN/m.

Assign all loading combination and consider only the case of maximum hogging moment at support 'B'.

Use IS : 456 - 2000 provision for L.S.M.

OR

Q4) a) Design the smallest section for a continuous reinforced concrete rectangular beam of width 300mm to resist an elastic factored moment 300 kN.m at an interior support.

The moment redistribution is limited to 30%.

Use Materials : M20 grade of concrete,

and HYSD steel of grade Fe415 **[10]**

b) A reinforced concrete beam has the following data.

Width of section = 250mm

Effective depth = 450mm

Reinforcement = 2 TOR 25 + 2 TOR 20

Factored shear force = 250kN

Materials - M20 and Fe415

Design the shear reinforcement using only vertical stirrups. **[15]**

SECTION - II

Q5) The centre line plan of a typical floor of building is as shown in fig. 1. Classify the slabs structurally and design the floor slab S_1 and S_2 only for flexure. Draw neat sketches showing details of reinforcements and torsional reinforcement.

Use Materials : M20 grade of concrete.

Fe415 type of steel reinforcement.

Assume suitable data. **[25]**

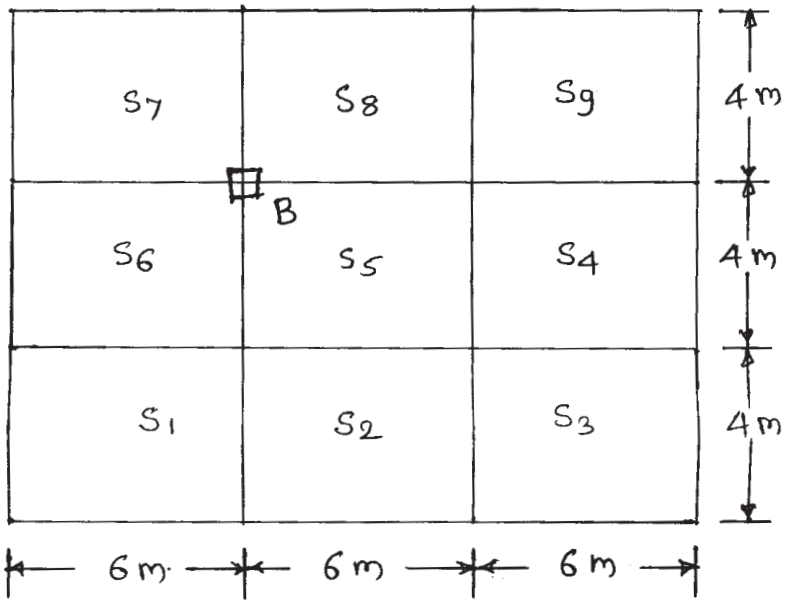


Fig. No. 1

OR

Q6) Design a dog legged staircase for it's flight I and II as shown in fig. No II. for the following data.

Floor to floor height = 3m.

Rise = 150mm, Tread = 255mm

Width of landing = 1m

Width of stair = 1.25m

At the ground floor, plinth beam is provided below Ist step.

Use Materials - M20 grade concrete & HYSD steel of grade Fe415. **[25]**

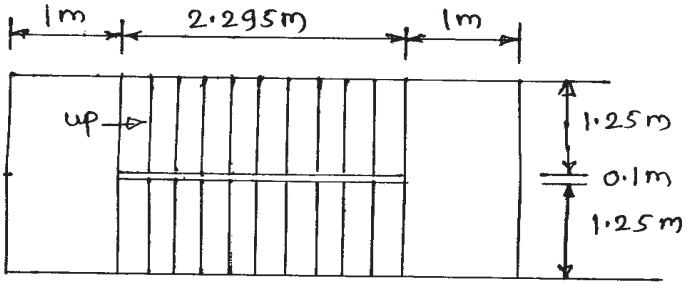


fig No - II

Q7) Design an axially loaded short column at B as shown in Fig I. for G + 2 building with isolated footing for the following data.

Floor to floor height = 3.3m.

Height of plinth above ground level = 0.7m

Depth of foundation below G.L = 1.3m.

L.L. on all slabs = 3.5 kN/m^2

F.F.L. on all slabs = 1.20 kN/m^2

Thickness of slab = 135mm

Size of wall on all floor beams = 230 mm × 3000mm.

Size of parapet wall = 0.150m × 0.9m.

Size of all beams = 230mm × 400mm

S.B.C. of soil = 200 kN/m^2.

Use Materials - M20 and Fe415

Show details load and design calculations.

Draw neat sketches giving reinforcement details. **[25]**

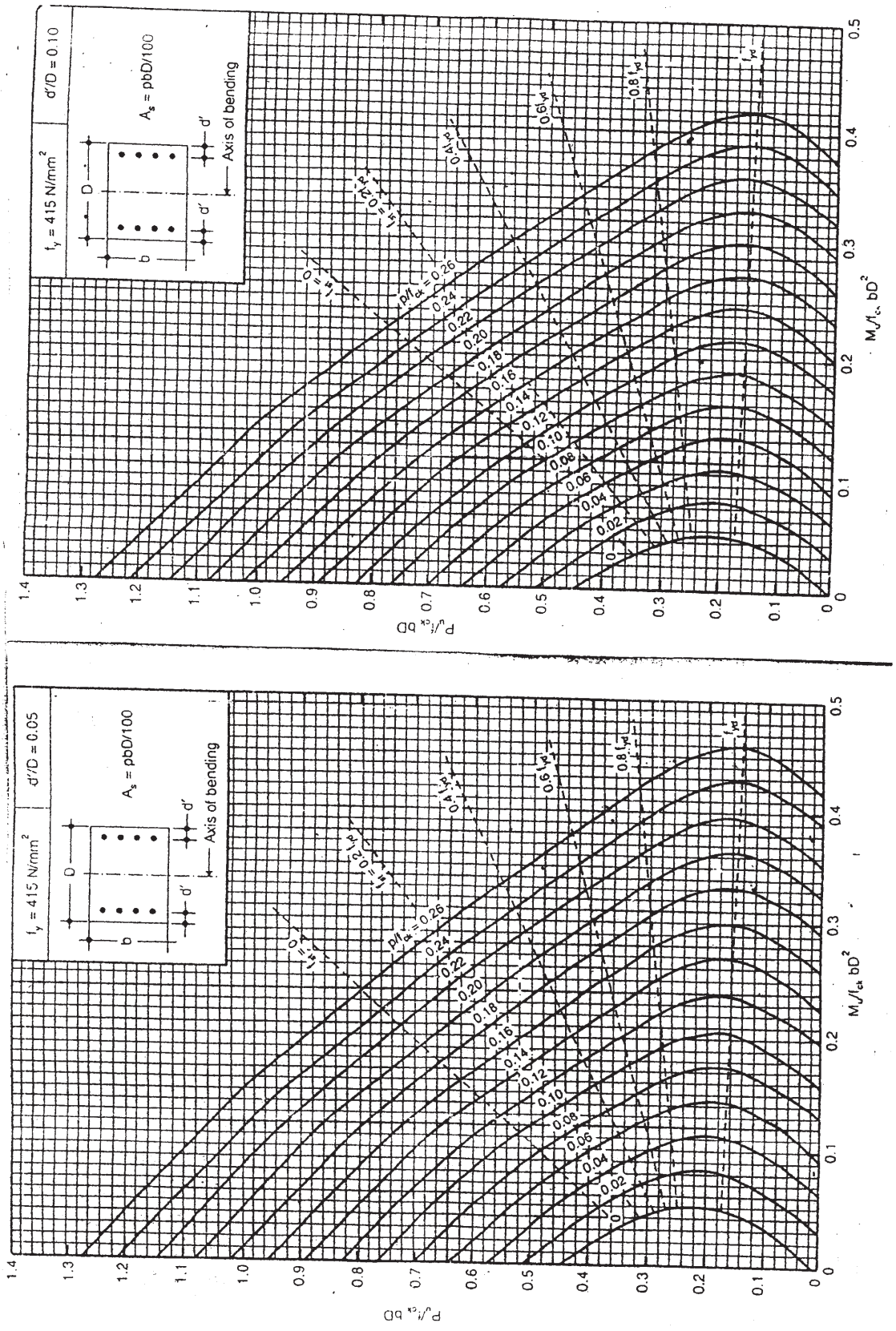
OR

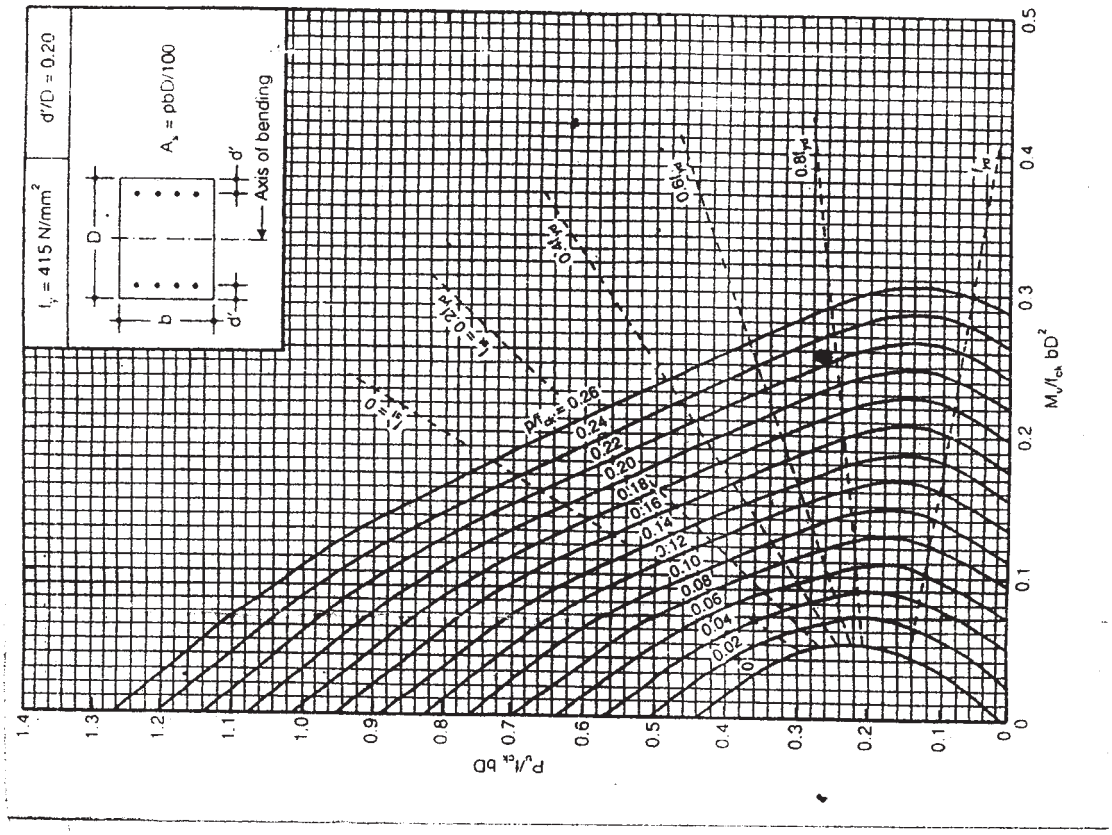
Q8) Design a rectangular column subjected to a working load of 775 kN and working moment of 65 kNM about major axis. The unsupported length of column is 3.2 m. Assume column effectively held in position but not restrained against rotation.

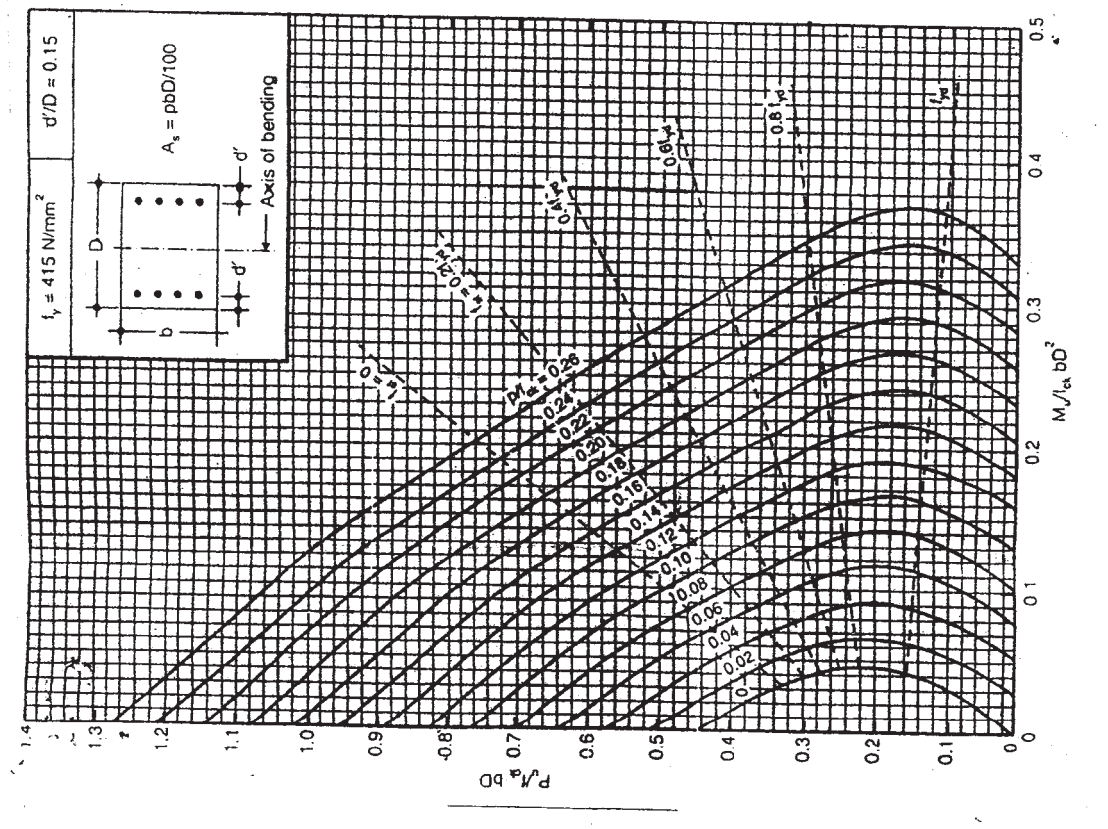
Also design its footing considering above moment. Take S.B.C. of soil = 225 kN/m^2.

Use Materials : M20 and Fe415.

Show details design calculations and reinforcement details. (use charts) **[25]**


f_y = 415 N/mm^2
d'/D = 0.10
A_s = pbD/100
Axis of bending
P_u/f_{ck} bD
M_u/f_{ck} bD^2
f_y = 415 N/mm^2
d'/D = 0.05
A_s = pbD/100
Axis of bending
P_u/f_{ck} bD
M_u/f_{ck} bD^2


f_y = 415 N/mm^2
d'/D = 0.20
A_s = pbD/100
D
b
d'
Axis of bending
P_u/f_{ck} bD
M_u/f_{ck} bD^2


f_y = 415 N/mm^2
d'/D = 0.15
A_s = pbD/100
D
b
d'
Axis of bending
P_u/f_{ck} bD
M_u/f_{ck} bD^2

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P956

[Total No. of Pages : 4

[4163] - 4

T.E. (Civil)

GEOTECHNICAL ENGINEERING

(2003 Pattern) (Theory) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Clearly explain the use of knowledge of geotechnical in construction of **[6]**

i) Embankment for road or railway

ii) Earth retaining wall

b) What are the major soil deposits in India? Explain in detail **[6]**

c) Define the terms: Water content, Void ratio, degree of saturation, specific gravity and state different methods to find water content of a given soil. **[6]**

OR

Q2) a) Draw a neat sketch of plasticity chart as given by IS. **[6]**

b) The weight density of soil sample is 20 kN/m^3 and its water content is 18%. Determine its dry density, Void ratio, Porosity, and degree of saturation. Assume G = 2.7. **[8]**

c) Explain soil as a three phase system. **[4]**

P.T.O

Q3) a) Define coefficient of permeability and derive equation for coefficient of permeability used in constant head method. **[6]**

b) Calculate the coeff. of permeability of a soil sample, 6 cm in height and 50 cm^2 in cross sectional area, if quantity of water equal to 430ml passed down in 10 minutes under an effective constant head of 40 cm. **[6]**

c) State and explain the factors affecting permeability of soil. **[4]**

OR

Q4) a) What are the properties of flow net. **[4]**

b) What is quick sand condition and derive the relation of critical gradient. **[6]**

c) Explain average permeability of soil parallel to the bedding planes **[6]**

Q5) a) Differentiate between light weight compaction test and heavy compaction test. **[6]**

b) Draw a moisture density curve and obtained MDD and OMC with following records. **[6]**

Bulk wt. density (kN/m^3)	16.20	17.30	18.60	19.10	18.60	14.75
Water Content %	12.50	16.50	20.00	24.50	30.00	34.50

c) Explain how compaction can be controlled on field by using Proctor needle. **[4]**

OR

Q6) a) What is 'equivalent point load method' to find vertical stress in soil? **[6]**

b) A circular footing 2.5 m diameter carries a load of 1000 kN. Determine stress increment at a depth of 5 m below the center of footing using Boussinesq equation? **[6]**

c) State Boussinesqs equation for analysis for stress distribution in soil due to a concentrated load and assumption made in his analysis **[4]**

SECTION - II

Q7) a) What are the advantages and disadvantages of direct shear test. **[6]**

b) What are the factor affecting shear strength of soil. **[6]**

c) A Vane 10 cm long, 8 cm in diameter, was pressed in to the soft clay at the bottom of the bore hole. Torque was applied and value at failure was 45 Nm. When failure took place, subsequently the vane rotated rapidly so as to completely remould the soil. The remoulded soil was sheared at a torque of 18 Nm. Calculate the cohesion of the clay in the natural and remoulded state. **[6]**

OR

Q8) a) Explain how unconfined compression test is special case of triaxial test. **[6]**

b) Draw a typical Mohr circle for unconfined compression test and explain how would you determine the shear strength parameter from Mohr circle. **[6]**

c) The law of shearing strength for a soil is known to be $\tau_f = (10 + 0.667\ \sigma_f)$ kN/m. Determine the deviator stress at failure for a triaxial loading, if constant cell pressure is 150 kN/m^2. **[6]**

Q9) a) Explain Rehbann's graphical method for evaluation of earth pressure. **[6]**

b) A cohesive soil has a unit weight of 19.20 kN/m^3 and unit cohesion as 12 kN/m^2 and angle of internal friction 10º.Calculate a critical height of vertical excavation that can be made without any lateral support. **[6]**

c) Explain effect of wall moment on earth pressure. **[4]**

OR

Q10) a) Describes with figures, the mode of failure for finite and infinite slopes. **[6]**

b) What is Taylor's stability numbers. **[4]**

c) Define the terms: Active, Passive and at rest condition. Draw neat sketches. **[6]**

Q11) a) What are different index properties of rocks? What is their significance **[6]**

b) Discuss geological classification of rocks. Give examples. **[6]**

c) Write a short note on **[4]**

i) Porosity

ii) Sonic Velocity

OR

Q12) a) Explain behavior of rocks in Triaxial compression. **[8]**

b) Explain density and durability of rocks. **[8]**

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Total No. of Questions : 12] **SEAT No. :**

P957 **[Total No. of Pages : 3**

[4163] - 5

T.E. (Civil)

CONSTRUCTION TECHNIQUES & MACHINERY

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer Q.No. 1 or 2, 3 or 4, 5 or 6 from Section - I and 7 or 8, 9 or 10, 11 or 12 from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Electronic pocket calculator is permitted.***
6) ***Assume suitable data, if necessary.***

Q1) a) With a suitable example each, explain the concepts of labour - oriented & equipment oriented works. Discuss the drawbacks of both. **[8]**

b) Explain the sentence 'construction activity plays an important role in national & global development'. **[6]**

c) Write short notes on **[4]**

i) Demolition techniques.

ii) Quality control for prefab - elements.

OR

Q2) a) Discuss the merits & demerits of the precast & prefabricated construction giving suitable field examples. **[8]**

b) Enlist the various equipments used for material handling & with a neat labelled sketch explain tower crane. **[6]**

c) Write short notes on

i) Autoclave curing.

ii) Safety parameters in using construction equipments. **[4]**

Q3) a) Discuss the advantages & various applications of pumped concrete. **[6]**

b) Explain the methods of dewatering in brief. **[6]**

c) Write short note on 'transit mixer'. **[4]**

P.T.O.

OR

Q4) a) What do you mean by RMC? What are the advantages of RMC? Describe the production process of RMC at plant with the help of a neat sketch. **[8]**

b) Write short notes on **[8]**

i) Dredging techniques.

ii) Tunnel form work.

Q5) a) Give the classification of crushers & explain any one of them detail. **[6]**

b) What are the likely damages or defects that can lead the floor? What are the factors considered while designing & constructing industrial flooring? **[6]**

c) Write short note on 'Gunitting'. **[4]**

OR

Q6) a) Describe crushing & screening plant giving the flow chart of aggregate processing plant. **[8]**

b) Write short notes on **[8]**

i) Air compressors.

ii) Tunnel boring machine.

SECTION - II

Q7) a) Discuss the various factors affecting the selection of earth moving equipments. **[10]**

b) Distinguish between power shovel & back hoe giving sketches, working operations & uses of each. **[8]**

OR

Q8) a) Compare scrapers with respect to all other earthmoving equipments. **[8]**

b) Explain the advantages of trenching machines over any other excavators. Also justify your answer giving suitable examples. **[6]**

c) Explain the terms **[4]**

i) work cycle.

ii) bucket fill factor.

Q9) a) State any two applications where slipform techniques has been used? What are the advantages & disadvantages of slip forming? What are the precautions to be taken while performing the slipforming operations? **[8]**

b) Explain the various important properties of aggregate, required in asphalt mix production. **[6]**

c) Write short note on 'dry lean concrete'. **[2]**

OR

Q10) a) What do you mean by Pavement Quality Control? Explain P.Q.C in brief with the help of neat sketch. **[6]**

b) Briefly describe the hot mix & cold mix plant of bituminous concrete mix. **[8]**

c) Give the classification of asphalt. **[2]**

Q11) a) What do you mean by depreciation? Explain any one method of depreciation in detail. **[6]**

b) What do you mean by economic life of an equipment? What are the aspects considered while preparing the life tables for equipments. **[6]**

c) Write short note on 'equipment working rates'. **[4]**

OR

Q12) a) What do you mean by hourly production of equipments? How the production rate for an equipment can be found out? **[4]**

b) Write short notes on **[12]**

i) Overheads.

ii) Record keeping.

iii) Preventive maintenance.

iv) Scrap & salvage value.

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Total No. of Questions : 12]

SEAT No. :

P958

[Total No. of Pages : 4

[4163] - 9

T.E. (Civil)

ENVIRONMENTAL ENGINEERING - I

(2003 Patern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II .***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain following effects of noise on human. **[6]**

i) Audiological ii) Physiological

iii) Physical iv) Annoyance

b) Explain various techniques used to control noise pollution. **[6]**

c) State the source categories of solid waste **[4]**

OR

Q2) a) State various methods used for disposal of solid waste. Explain any one in detail. **[6]**

b) Write short notes on : **[6]**

i) Incineration.

ii) Deep-well injection.

c) State the factors which affect the generation rate of solid waste. **[4]**

P.T.O.

Q3) a) Explain various primary and secondary meteorological parameters which affect dispersion of air pollutants. **[6]**

b) What are the effects of particulate matter on human health and materials? **[6]**

c) Explain working principle of fabric filter with a neat sketch. **[4]**

OR

Q4) Write short notes on following (Any Four) **[16]**

a) Acid rain formation and effects.

b) Photochemical smog.

c) Green house effect.

d) High volume sampler.

e) Zones of atmosphere.

Q5) a) Write a note on variations in rate of demand. Explain clearly how you take into account these variations in the design of various units. **[6]**

b) Following is the population data for a town. Water supply scheme is to be designed for this town with a design period of 30 years. Find the population at the end of the year 2040 by arithmetical method. **[6]**

Year	1970	1980	1990	2000	2010
Population	59,000	62,000	68,000	74,000	79,000

c) Write down the Indian Standards for the quality of potable water for **[6]**

i) Odour ii) Turbidity

iii) Sulphates iv) Hardness

v) Alkalinity vi) Colour

OR

Q6) a) What do you know about Rain Water Harvesting? How it is benefited? **[6]**

b) Describe different phases involved in a water supply scheme. **[6]**

c) Draw a flow diagram of river water treatment process for a city. Explain the purpose of any two units used for water treatment. **[6]**

SECTION - II

Q7) a) The maximum daily demand of water is 114 MLD. Design aeration fountain (Cascade Aerator). **[8]**

b) Prove that theoretically, the surface loading (Q/A) and not the depth is a measure of effective removal of particles in a sedimentation tank. **[8]**

OR

Q8) a) Explain in detail, the working of a circular clariflocculator. Draw the typical cross-section of a circular clariflocculator, showing various components. **[8]**

b) Explain with a neat sketch, inlet and outlet arrangements adopted for a rectangular sedimentation tank. (minimum two for each type). **[8]**

Q9) a) Write comparison of slow and rapid sand gravity filter in tabular form with reference to **[6]**

i) Loss of head
ii) Size of bed
iii) Coagulation
iv) Method of cleaning
v) Economy
vi) Skilled supervision

b) What are the different (any three) disinfecting agents? What are the requirements (any three) of good disinfecting agent? **[3+3]**

c) Explain anyone method of desalination. **[4]**

OR

Q10) a) Explain advantages and disadvantages of lime-soda process of water softening. **[6]**

b) Draw a neat sketch of rapid sand gravity filter showing various components. **[6]**

c) Write a short note on break point chlorination. **[4]**

Q11) a) Write short note on: **[3 x 3]**

i) Dead end system

ii) Zoning of areas

iii) Pressure in the distribution system.

b) Write a short note on mass curve method. **[5]**

c) Differentiate between continuous and intermittent system. **[4]**

OR

Q12) a) Differentiate between fire reserve and break down reserve. **[8]**

b) State the requirements which are considered while designing the distribution system. **[5]**

c) Draw a line sketch of R.C.C. Elevated Service Reservoir (ESR) and give the list of accessories provided for ESR. **[5]**

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Total No. of Questions : 12] **SEAT No. :**

P959 **[Total No. of Pages : 3**

[4163] - 10

T.E. (Civil)

TRANSPORTATION ENGINEERING - I

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a note on organization of Indian Railways and also mention the various zones of Indian Railways. **[4]**

b) Explain in brief the 'Necessity of uniformity of gauge in our country. **[4]**

c) Enlist the various types of sleepers & explain any one in brief. **[4]**

d) Define Ballast. State various ballast materials used for track with their suitability. **[6]**

OR

Q2) a) State the comparison between wooden sleepers & concrete sleepers. **[6]**

b) Define Creep. What are its effects. How it is adjusted. **[6]**

c) Draw a typical cross section of Broad Gauge single line railway track in embankment. **[6]**

Q3) a) Explain in brief the advantages & disadvantages of fishplated & welded rails. **[4]**

b) Define gradient. Enlist various types of gradients with their permissible values adopted on Indian railways. **[4]**

c) Define the following terms : **[8]**

i) Actual cant.

ii) Cant excess.

iii) Negative superelevation.

iv) Cant deficiency.

P.T.O.

OR

Q4) a) What is negative superelevation. Under what circumstances it is provided. Draw a neat sketch to justify your answer. **[6]**

b) Draw a neat sketch of left hand turnout. **[4]**

c) Explain with a neat sketch overriding and undercut switches. **[6]**

Q5) a) Draw a neat sketches of the following : **[6]**

i) Water column

ii) Buffer stop

iii) Fouling mark.

b) Write a short note on stations and yards. **[6]**

c) What are the types of rail maintenance. Also state the importance of track maintenance. **[4]**

OR

Q6) Write a short notes on following : **[16]**

a) Measured shovel packing (MSP)

b) Tram Line method of plate laying.

c) Metro Railway

d) Directed Track Maintenance.

SECTION - II

Q7) a) What is Tunnel. State the merits and demerits of tunnel. **[6]**

b) Explain with a neat sketch 'Transfering centre line in tunnel. **[4]**

c) What are portals. What points are considered while designing portals. **[4]**

d) Explain in brief pilot Tunnel and Twin Tunnels. **[4]**

OR

Q8) a) Draw a neat sketches of different shapes of Tunnel. Also state when each one is preferred. **[6]**

b) Compare advantages and disadvantages of tunnels with open cut. **[4]**

c) Write a note on various drilling patterns. **[4]**

d) Explain with a neat sketch heading and Bench Method. **[4]**

Q9) Write a short notes on following : **[16]**

a) Grass Hopper Method.

b) Shotcreting and Rock Bolting.

c) Tunnel Ventilation.

d) Tunnel Linings.

OR

Q10) a) Discuss in brief safety precautions taken in tunnelling operation. **[4]**

b) Explain in brief the various methods of providing tunnel ventilation. **[4]**

c) Explain in brief the drift method of tunnelling. **[4]**

d) Explain any one method of tunnelling in soft rock. **[4]**

Q11) a) State the requirements of Natural Harbour. **[4]**

b) Explain in brief the following : **[8]**

i) Fender.

ii) Jetty.

iii) Wharf.

iv) Guay.

c) Write a short note on merits & demerits of water transportation. **[4]**

OR

Q12) a) Define port. What are their requirements. **[4]**

b) Explain in brief Natural Harbour and Artificial Harbour. **[4]**

c) Differentiate between Jetty and Wharf. **[4]**

d) State comparison between Dry Dock and Wet Dock. **[4]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P960

[Total No. of Pages : 8

[4163] - 11
T.E. (Mechanical)
DESIGN OF MACHINE ELEMENTS
(2003 Pattern) (Sem. - I)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from section - I and 3 questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the basic procedure of machine design. **[6]**

b) Write a note on "use of standards in design". **[4]**

c) Write appropriate equations for following failures while designing knuckle joint. **[6]**

i) Shear failure of pin.
ii) Crushing failure of pin in eye.
iii) Crushing failure of pin in fork.

Also draw neat sketch of knuckle joint.

OR

Q2) a) A bracket shown in Fig 1 is subjected to pull of 5 kN acting at an angle of 45° to vertical. The bracket has a rectangular section whose depth is two times its thickness. If the permissible tensile stress is 55 N/mm^2. Determine the cross - section of the bracket. **[8]**

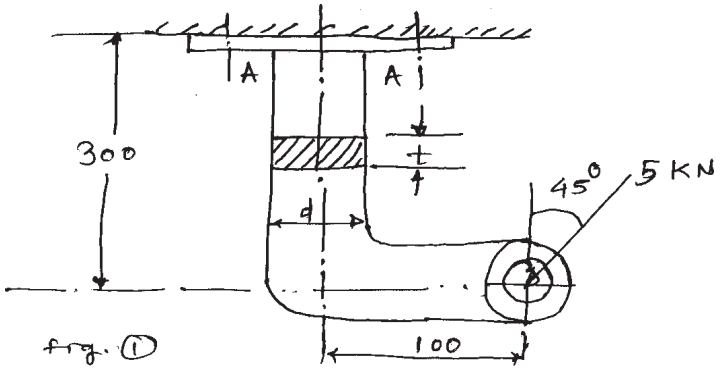


fig. (1)

P.T.O.

b) What are preferred numbers? Explain R-10 series. **[4]**

c) Explain the procedure to design the fulcrum pin in case of right angled bell crank lever. **[4]**

Q3) A shaft is supported on two bearings which are 1 m apart. The shaft carries two belt pulleys A & B at a distance of 200 mm & 800 mm from the left hand bearing. The diameter of both pulleys is 500 mm with 180° overlap. The two belt directions are perpendicular to each other. The maximum belt tension in any belt is 2500 N. The ratio of belt tension is 2.2. The shaft is made of steel with an ultimate tensile strength of 800 N/mm^2 and tensile yield strength of 550 N/mm^2. If K_b and K_t are 1.5 and 1.0 respectively. Design the shaft using ASME code.

If the permissible angle of twist is 2° per metre, and modulus of rigidity 80×10^3 N/mm^2, determine the diameter of shaft by rigidity consideration. **[16]**

OR

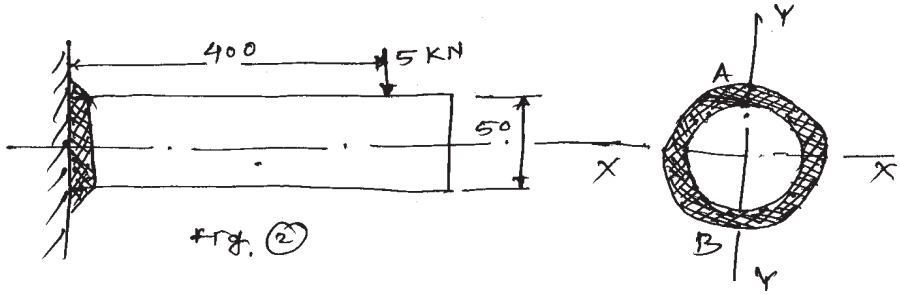
Q4) a) State Eastigliano's theorem & Explain how the theorem is useful in designing the shaft. **[6]**

b) Design the muff coupling to connect two mild steel shafts to transmit 35 Kw at 1440 rpm. The C.I. sleeve connects the shafts through two mild steel sunk keys. The maximum torque transmitted is 25% greater than the average torque.

Material properties.

- Allowable shear stress for C.I. = 15 N/mm^2.
- Allowable shear stress for mild = 65 N/mm^2 steel.
- Allowable crushing stress for mild = 160 N/mm^2 steel
- Assume additional data, if necessary. **[10]**

Q5) a) A circular bar of 50 mm diameter is welded to a steel plate by an annular fillet weld as shown in Fig. 2. The force of 5 kN is applied on the bar at a distance 400 mm from the plane of the weld. If the allowable shear stress in the weld material is 94 N/mm^2 determine the size of the weld. **[9]**



b) A 200 × 150 × 10 mm steel angle is to be welded to a steel plate by the fillet welds as show in fig. 3. If the angle is subjected to a static load of 200 kN. Find the length of weld at the top and bottom. The allowable shear stress for static loading may be taken as 75 MPa. **[9]**

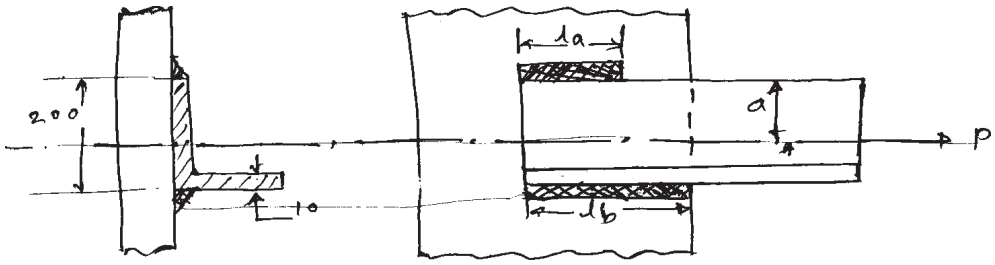
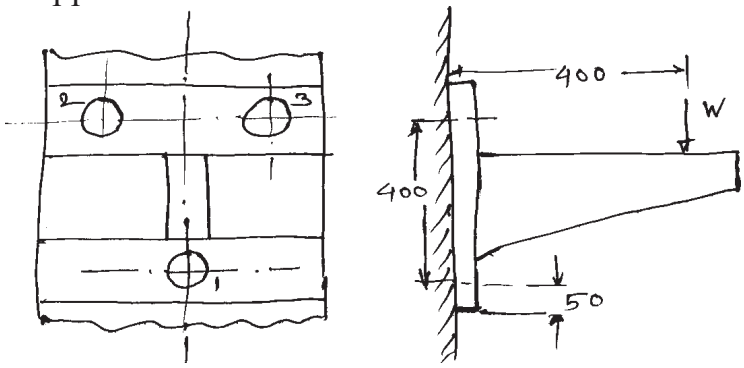


Fig. (3)

OR

Q6) a) A steel bracket is fixed to the vertical support by three M16 bolts (dc = 14.1 mm), two at the top and one at the bottom, as show in fig 4. If the permissible shear stress for the bolt is 55 N/mm^2. Determine the maximum load that can be supported by bracket at 400 mm. From the vertical support. **[9]**



b) Explain the procedure for determining the various dimensions of the turn - buckle stating the corresponding design equations. Draw a neat sketch of the turn buckle. **[9]**

SECTION - II

Q7) a) List advantages & disadvantages of trapezoidal threads over square threads. **[6]**

b) A double threaded power screw with I.S.O. Metric trapezoidal threads, is used to raise a load of 300 kN. The nominal dia is 100 mm & the pitch is 12 mm. The coefficient of friction at screw thread is 0.15. Neglecting the collar friction, Calculate : **[10]**

i) Torque required to raise the load.
ii) Torque required to lower the load.
iii) Efficiency of the screw.

OR

Q8) a) Obtain an equation of efficiency of a square threaded screw, discuss its relation with helix angle & state the ways to increase efficiency of square threaded screw. **[6]**

b) In a machine the tool holder is pulled by means of an operating nut mounted on a screw. The tool holder travels at a speed of 5 m/ min . Screw has single start square threads of 48 mm. nominal diameter & 8 mm pitch. The operating nut exerts a force of 500 N to drive the tool holder. The mean radius of the friction collar is 40 mm. The coefficient of friction at threads & collar surface is 0.15. Calculate **[10]**

i) Power required to drive the screw.

ii) The efficiency of the mechanism.

Q9) a) Describe with suitable sketches how endurance limit is determined in a laboratory with a rotating beam machine. **[8]**

b) A flat plate subjected to a tensile force of 5 kN is shown in Figure (1) below. The plate material is gray cast iron FG 200 & the factor of safety is 2.5. Determine the thickness of plate. **[8]**

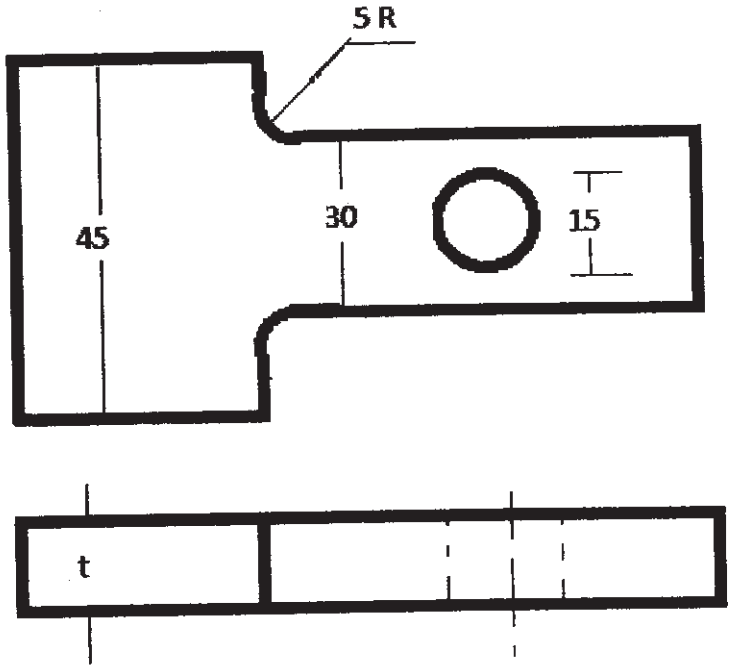


Figure 1

OR

Q10) a) Write about stress concentration effect, and ways to reduce it by giving practical examples. **[6]**

b) A cantilever beam made of cold drawn steel 40C8. Ultimate tensile strength 600 N/mm yield strength 380 N/mm^2 is shown in figure. 2. The force p acting at the free end varies from - 50 N to +150N. The expected reliability

is 90% & the factor of safety is 2. The notch sensitivity factor at the fillet is 0.9. Determine the diameter 'd' at the fillet cross section. Use tables & charts given in question paper. **[10]**

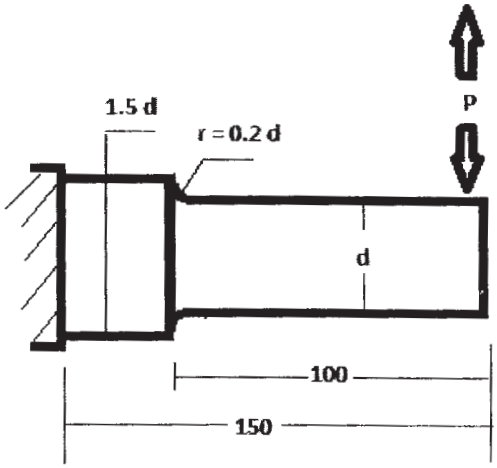


Figure 2

Q11) a) Discuss Wahl factor in case of helical springs. **[4]**

b) Discuss springs in parallel & springs in series show effect of combination on the stiffness. **[4]**

c) A valve spring of IC engine is to be designed for following details. **[10]**

i) Spring load = 100 N when valve is closed

150 N when valve is open.

ii) Space constraints for fitment of spring arc
Inside guide bush dia = 24 mm.
Outside recess dia = 36 mm.
Valve lift = 5 mm

iii) Spring steel has following properties

τ_{per} = 350 Mpa

G = 8.4×10^4 N/mm^2

iv) Spring ends are squared and ground.

Design :

1) Wire dia
2) Spring index.
3) Total no. of coils.
4) Solid length of spring.
5) Free length of spring & pitch.

OR

Q12) a) Write short notes on any two of the following. **[10]**

i) Multi leaf spring.

ii) Nipping of leaf spring.

iii) Concentric springs.

b) A helical torsion spring of mean dia 50 mm is made of 5 mm wire diameter. If a torque of 4 N-m is applied on this spring, find the bending stress induced and the angular deflection in degrees. Assume modulus of elasticity of the spring material as 210×10^3 N/mm^2 & number of effective turns as 6. **[8]**

Table 1 Values of K_b

Dia (d) mm	K_b
$d \leq 7.5$	1.00
$7.5 < d \leq 50$	0.85
$d > 50$	0.75

Table 2 Values of K_c

Reliability R(%)	(K_c)
50	1.00
90	0.897
95	0.868
99	0.814
99.99	0.753

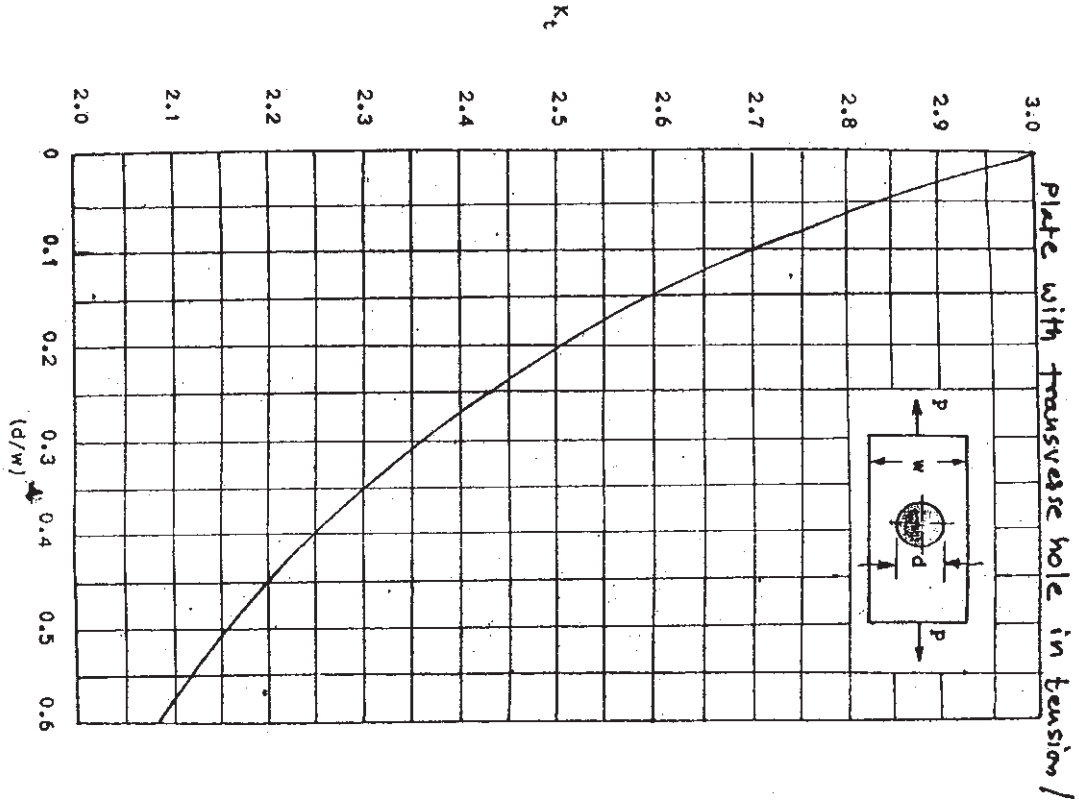
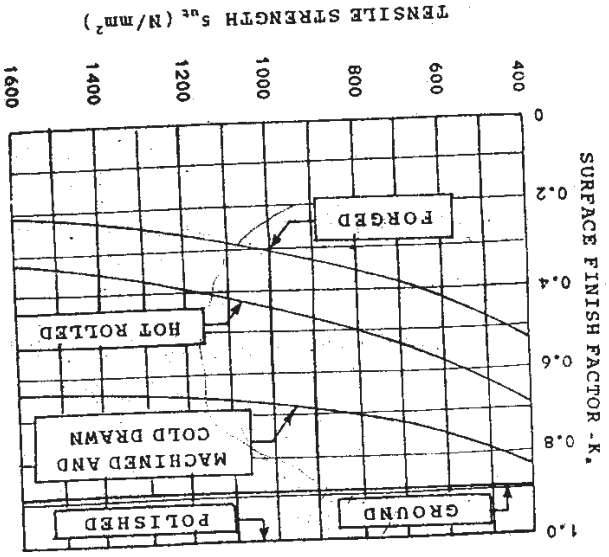
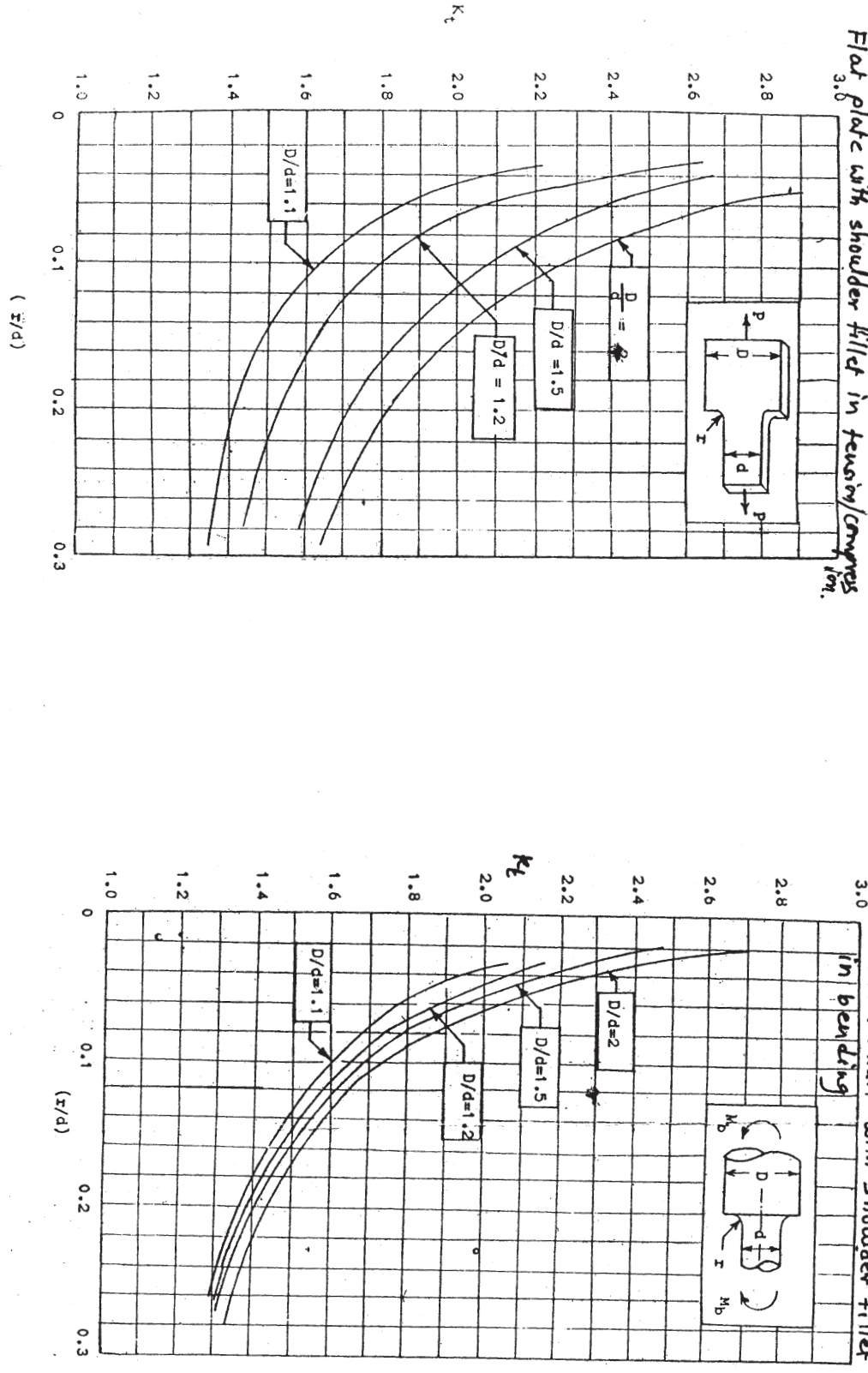


Plate with transverse hole in tension
K_t
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
0
0.1
0.2
0.3
0.4
0.5
0.6
(d/w)
P
w
d
P


TENSILE STRENGTH S_{ut} (N/mm²)
1600
1400
1200
1000
800
600
400
0
0.2
0.4
0.6
0.8
1.0
SURFACE FINISH FACTOR - K_a
FORGED
HOT ROLLED
MACHINED AND COLD DRAWN
POLISHED
GROUND


Flat plate with shoulder fillet in tension/compression.
Round shaft with shoulder fillet in bending
K_t
(r/d)
D/d = ∞
D/d =1.5
D/d = 1.2
D/d=1.1
D/d=2
D/d=1.5
D/d=1.2
D/d=1.1
P
D
d
r
M_b

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P961

[Total No. of Pages : 7

[4163] - 12

T.E. (Mechanical)

(Common to Mech Sand for Sem. - II)

HEAT TRANSFER

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II .***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) State the Fourier law of heat conduction. **[4]**

b) Explain variation of thermal conductivity in solids and liquids with temperature and state the reasons. **[4]**

c) A metal plate with dimensions 5m × 3m and negligible thickness has a surface temperature of 300°c. One side of it loses heat to the surrounding air at 30°c. Heat transfer coefficient between the plate surface and air = 20W/m^{2}K. Emissivity of plate surface = 0.8. Calculate, **[8]**

i) Rate of heat loss by convection

ii) Rate of heat loss by radiation

iii) Combined convection & radiation heat transfer coefficient.

OR

P.T.O.

Q2) a) Derive a general three dimensional heat conduction equation in Cartesian coordinate system. Reduce it as **[8]**

i) poission equation

ii) Fourier equation

iii) Laplace equation.

b) A spherical storage of steel of 20 cm inner dia. and 30 cm outer dia. (k = 50 W/m K) stores liquid oxygen, due to which its inside surface temperature is maintained at –150°c. Outside surface is exposed to ambient air at 20°c with convective heat transfer coefficient of 10W/m^2 K. Determine heat transfer rate. What shall be the percentage decrease in heat transfer rate, if the steel sphere is applied with layer of insulation (K= 0.5 W/m°c) of 25mm thickness on its outside surface? **[8]**

Unit - II

Q3) a) Derive an expression for the temperature distribution in a hollow cylinder having inner radius R_1 and outer radius as R_2 with uniformly distributed heat sources and inner face maintained at a temperature T_1. while the outer face is maintained at T_2. **[8]**

b) A plane composite slab with unit cross sectional area is made up of material 'A' (thickness = 100 mm, K_A = 60 w/m K) and material 'B' (thickness = 10 mm, K_B = 2 w/m K). Thermal contact resistance at their interface is 0.003 m^2 K/W. The temperature of open side of slab 'A' is 300°c and that of open side of slab 'B' is 50°c. Calculate, **[8]**

i) The rate of heat flow through the slab.

ii) Temperature on both sides of the interface.

OR

Q4) a) Derive expression for critical radius of insulation for a sphere using standard notations. **[8]**

b) During the ripening process of an orange, the energy released is estimated as 563 W/m^3. If the orange is assumed to be homogeneous sphere with k = 0.15 W/m K. Compute the temperature at the center of orange and the heat flow from the outer surface. Assume a diameter of orange as 8cm and outer surface temperature as 2°c. **[8]**

Unit - III

Q5) a) Explain the following: **[8]**

i) Biot and Fourier numbers

ii) Fin efficiency and Fin effectiveness.

b) Following are the specifications of an insulated end, circular cross sectioned fin. **[10]**

Length = 25 cm

Diameter = 2.5cm

Base surface temperature = 100°c.

Heat transfer coefficient between fin surface and surrounding

air = $20w/m^2K$

Temperature of surrounding air = 30°c.

Calculate the tip temperature of the fin if it is made up of,

i) Copper with k = 380 w/mk

ii) brass with k =110 w/mk.

OR

Q6) a) Derive an expression for instantaneous heat flow rate and total heat transfer under unsteady state heat conduction. **[8]**

b) A solid brass sphere 20cm diameter initially at a temperature of 200°c is suddenly exposed to air stream at –10°c with a convective heat transfer coefficient of 50 W /m^2K. Find the time required by the sphere to attain temperature of 0°c ? **[10]**

Properties are:

Copper: density = 7,670 kg/m^2; c = 0.372 kJ/kg °c; k = 370 W/mK.

Brass: density = 8,552 kg/m^3; c = 0.385 kJ/kg °c; K = 100 W/m K.

SECTION - II

Unit - IV

Q7) a) Using the concept of 'surface Resistance' and 'Space Resistance', derive the expression for steady state heat transfer rate by radiation between the two long gray diffused parallel plates maintained at temperature T_1 and T_2 of emissivities of ε_1 and ε_2 having a thin radiation shield of emissivity ε_3 inserted in parallel between the two plates. **[8]**

b) A pipe carrying steam having an outside diameter of 20 cm passes through a large room and is exposed to air at temp of 30°c. Pipe surface temp. is 200°c. Find the total heat loss per meter length of pipe both by convection and radiation: Nu = 0.53 $(Ra)^{0.25}$ for horizontal pipe. **[8]**

Temp. °C	K (W/mK)	V X 10^6 (m^2/s)	Pr
30	0.0267	18.60	0.701
115	0.0330	24.93	0.687
200	0.0393	26.00	0.680

OR

Q8) a) Explain the following: **[8]**

i) Lambert Cosine Law

ii) Wien's Displacement Law.

b) The radiation shape factor of the circular surface of a thin hollow cylinder of 10cm dia. And 10 cm length is 0.1716. what is the shape factor of the curved surface of the cylinder with respect to itself? **[8]**

Unit - V

Q9) a) Write expressions for and physical significance of the following: **[9]**

i) Grashoff number

ii) Reynold's number

iii) Rayleigh number

b) A circular disc of dia. 25cm is exposed to air at 293 K. If the disc is maintained at 393 K, estimate the heat transfer rate from it, when; **[9]**

i) Disc is kept horizontal (take characteristic length= Area/perimeter)

ii) Disc is kept vertical.

For air at 70°c, k = 0.03 W/m K; Pr = 0.697; v = $2.076 \times 10^{-6} m^2/s$

Use the following correlations;

$Nu = 0.14 (Ra)^{0.334}$ for surface facing upward

$Nu = 0.27 (Ra)^{0.27}$ for surface facing downward

$Nu = 0.59 (Gr. Pr)^{0.25}$ for vertical surface.

OR

Q10) a) Differentiate between internal flow and external flow. **[4]**

b) Write short note on Hydraulic diameter. **[4]**

c) Air at temperature of 10°c flows through a square duct of side 20 cm with a velocity of 12m/s and leaves the duct to heating by duct surface uniformly maintained at 50°c. Find heat transfer rate to air, if the length of duct is 5m. **[10]**

Use the following correlations:

$Nu = 0.023Re^{0.8} Pr^{0.4}$ for turbulent flow

$Nu = 3.66$ for laminar flow.

Take the air properties: $Pr = 0.715$; $k = 0.025$ W/m K; $v = 13.55 \times 10^{-6}$ m^2/s.

Unit - VI

Q11) a) Draw labeled temperature profiles of the following types of Heat Exchangers: **[5]**

i) Direct transfer type parallel flow

ii) Direct transfer type counter flow

iii) Condenser

iv) Evaporator.

b) Differentiate between Film wise condensation and Drop wise condensation. **[3]**

c) A hot air fluid at 200°c enters a heat exchanger at a mass flow rate of 10000 kg/hours. Its specific heat is 2kJ/kg K. It is to cooled by another fluid entering at 25°c with a mass flow rate of 2500 kg/hours and specific heat of 400 J/kg K. The overall heat transfer coefficient based on outside area of 20 m^2 is 250 W/m^2 K. find exit temperature of both the fluids when fluids are in parallel flow arrangement. **[8]**

OR

Q12) a) Explain the following: **[6]**

i) LMTD

ii) NTU

iii) Heat exchanger effectiveness.

b) A steam condenser is designed to condense 0.76 kg/min of steam with cooling water entering at 20ºc and leaving at 65ºc. Overall heat transfer coefficient = 3400 W/m^2 K. Calculate the surface area required for this heat exchanger. Saturation temperature of steam = 95.6ºc. $h_{fg\ steam}$ = 2270 kJ/kg. **[10]**

❄❄❄

Total No. of Questions : 12]

P980

SEAT No. : ____

[Total No. of Pages : 4

[4163] - 46
T.E. (Electrical)
POWER SYSTEM - II
(2003 Pattern) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is an equivalent π and equivalent T circuit of long transmission line? Derive an expression for the parameters of equivalent π circuit in terms of line parameters. **[8]**

b) A 350 km. long line has total series impedance of $180\angle 75°$ ohms/ph a total shunt admittance to neutral per phase of $1 \times 10^{-3}\angle 90$ siemens.

i) Find the constants of equivalent π circuit.

ii) Compare these constants with the constants of nominal π circuit and comment on the results. **[8]**

OR

Q2) a) Explain in detail concept of surge impedance loading, with the methods to improve it. **[8]**

b) What do you mean by line regulation and compensation. **[8]**

Q3) a) What is the significance of single line diagram in power system? With an illustration explain how to obtain the reactance diagram from the single line diagram. **[8]**

P.T.O.

b) Draw the reactance diagram for a given power system represented by a single line diagram. **[8]**

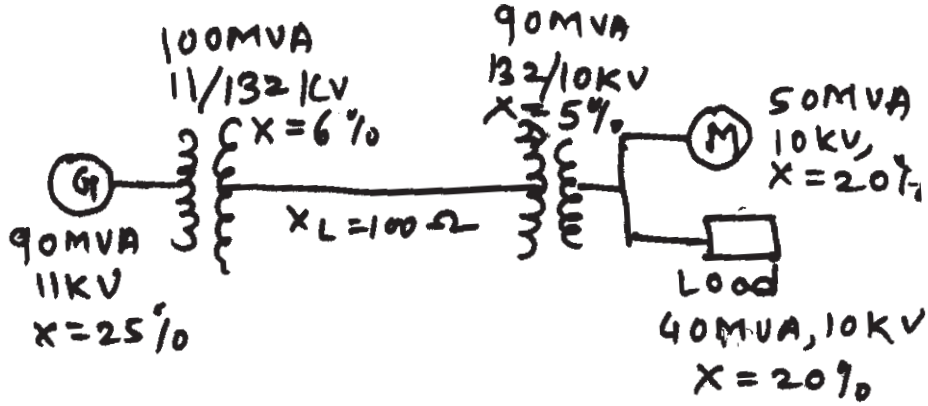


Fig 3 b

OR

Q4) a) Analyse and explain when sudden three phase short circuit fault occurs on an unloaded alternator, in connection with subtransient, transient, and steady state current and reactances. **[8]**

b) Explain what do you understand by d.c. offset current, and the effect of the instant at which short circuit occurs on the R-L circuit. **[8]**

Q5) a) What are symmetrical components used to analyse the unsymmetrical faults? Compare the fault analysis done for symmetrical and unsymmetrical faults. **[8]**

b) Derive the expression for three phase a.c. power, using symmetrical components of voltages and currents. **[10]**

OR

Q6) a) Obtain the expression for zero, positive, and negative sequence reactances for fully transposed transmission lines with self impedance of Z_S ohms and mutual impedance of Z_m ohms between the two lines. **[10]**

b) Derive the expression for fault current in case of double line to ground fault considering its sequence network. **[8]**

SECTION - II

Q7) a) Explain the significance, advantages and nature of elements of a bus admittance matrix. **[6]**

b) Explain the Newton-Raphson method for load flow study along with the flowchart. **[10]**

OR

Q8) a) Write the general form of power flow equations for a bus power system and explain : **[10]**

i) Nature and characteristics of equations.

ii) Various constraints to be considered.

iii) Types of buses

b) Determine Y bus matrix for the three-bus system for which line series impedances are as follows : **[6]**

Line (bus to bus)	Impedance (per unit)
1-2	0.06 + j 0.18
1-3	0.03 + j 0.09
2-3	0.08 + j 0.24

Neglect the shunt capacitances of lines.

Q9) a) Define power system stability. Explain different types of power system stability. **[8]**

b) A 50 Hz four pole turbo-generator rated 100 MVA, 11kV has an inertia constant of 8 MJ/MVA. **[8]**

i) Find the energy stored in the rotor at synchronous speed.

ii) If the mechanical input is reduced to 80 MW for an electrical load of 50 MW. Find rotor acceleration, neglecting mechanical and electrical losses.

iii) If the acceleration calculated in part (ii) is maintained for 10 cycles, find the change in torque angle and rotor speed in rpm at the end of this period.

OR

Q10) a) Derive the swing equation of a synchronous machine connected to an infinite bus. Discuss its applications. **[8]**

b) Discuss different factors affecting transient stability and methods to improve it. **[8]**

Q11) a) Give classification of HVDC transmission systems. State any two HVDC transmission systems in India. **[8]**

b) Compare HVAC transmission with HVDC transmission with advantages and disadvantages. **[10]**

OR

Q12) a) Explain the main components of HVDC transmission systems. **[10]**

b) Explain constant excitation angle control scheme in case of HVDC transmission system. **[8]**

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Total No. of Questions : 12]

P990

SEAT No. : ____

[Total No. of Pages : 3

[4163] - 59
T.E. (Electronics / E&TC)
ELECTROMAGNETIC WAVES & RADIATING SYSTEMS
(2003 Pattern) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the Electrostatic boundary conditions at an interface between conductor and free space. Also derive magneto static boundary conditions. **[10]**

b) Verify that within a conductor carrying current I, the magnetic field strength at a distance r from the centre of the wire is given by $H = \frac{Ir}{2\pi R^2}$,

Where R is the radius of the wire. Assume that current density is uniform over the cross section of the conductor. **[8]**

OR

Q2) a) State and explain Gauss's Law. Also explain application of Gauss's Law. **[8]**

b) Write a short note on continuity equation of current. **[6]**

c) What is open surface and closed surface? Which is the surface used in Divergence theorem? Why? **[4]**

Q3) a) State and explain Poynting Theorem. Also show that instantaneous power flow contains stored energy and the total power flowing in volume. **[8]**

b) The magnetic field intensity is given by $H = yz\,(x^2 + y^2)a_x - y^2xza_y + 4y^2x^2a_z$ A/m. Determine J at (1, 2, 0). **[8]**

P.T.O.

OR

Q4) a) State and explain Maxwell's Equation for time varying fields and modify them for free space. **[8]**

b) Show that continuity equation is contained in Maxwell's Second equation. **[8]**

Q5) a) Derive vector Helmholtz equations for electric and magnetic fields in a lossless dielectric medium. **[8]**

b) A plane wave at 100 MHz is propagating in a lossy material. The phase of the electric field shifts 90° over distance of 0.5m and its peak value is reduced by 25% for each meter travelled. Find α, β and V. **[8]**

OR

Q6) a) Define the following terms with mathematical expressions : **[8]**

i) Intrinsic impedance.

ii) Velocity of propagation.

iii) Depth of penetration.

iv) Surface impedance.

b) Electric field of electromagnetic wave in conducting medium is given by $E = 16e^{-0.05z} \sin(2 \times 10^8 t - 2z)\ a_x$ A/m

Find propagation constant, wavelength, wave velocity and skin depth. **[8]**

SECTION - II

Q7) a) What is reflection on transmission line? What are disadvantages of the same? Explain in brief the terms : reflection coefficient and SWR. **[8]**

b) State and explain the primary constants of a transmission line. **[8]**

OR

Q8) a) What is single stub matching? Explain the merits and demerits of single stub matching. **[8]**

b) Prove that the characteristic impedance of $\lambda/4$ line is geometric mean of source and load impedance, and also justify that $\lambda/4$ line will acts as an impedance inverter. **[8]**

Q9) a) Write a short note on antenna parameters (any four). **[8]**

b) An antenna has a radiation resistance of 72Ω, a loss resistance of 8Ω and a power gain of 12 dB. Determine antenna radiation efficiency and directivity. **[8]**

OR

Q10)a) Draw and explain equivalent circuit of transmitting and receiving antenna. **[8]**

b) Explain the concept of near field and far field and show that both the fields become equal at a distance of $\lambda/6$ from the transmitting antenna. **[8]**

Q11)a) What do you mean by pattern multiplication? Write down the array factor formula for N element linear array with uniform amplitude and spacing and explain every term involved therein. **[8]**

b) Write a short note on (any two) : **[10]**

i) Yagi Uda arrays.

ii) Turn stile antenna.

iii) Helical antenna.

OR

Q12)a) A 10 element broadside array of isotropic radiators is to have directivity of 7 dB. What is the minimum element spacing that achieves this directivity? **[8]**

b) Write a short note on (any two) : **[10]**

i) Parabolic reflector.

ii) Micro strip antenna.

iii) Horn antenna.

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Total No. of Questions : 12]

SEAT No. : ____

P991

[Total No. of Pages : 4

[4163] - 60
T.E. (Electronics/E &TC)
INFORMATION THEORY AND CODING TECHNIQUES
(2003 Pattern) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

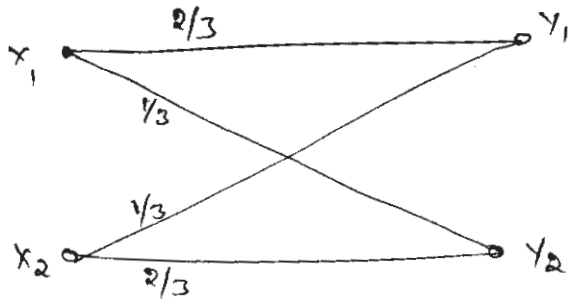
Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Source Coding Theorem? How data compaction is used for source coding. **[8]**

b) A discrete source transmits messages x_1 & x_2 with probabilities 5/6 and 1/6. The source is connected to channel as shown by figure. Calculate entropies, mutual information. **[8]**



OR

Q2) a) Calculate a binary optimal code for probabilities symbols using Huffman procedure and calculate code efficiency. **[8]**
0.2, 0.18, 0.12, 0.1, 0.1, 0.08, 0.06, 0.06, 0.06, 0.4

b) i) Prove that for a finite variance σ^2, the Guassian Random variable has the largest differential entropy attainable by any Random variable. **[4]**

ii) Show that entropy is given by $\frac{1}{2}\log_2[2\pi e \sigma^2]$. **[4]**

P.T.O.

Q3) a) Explain following terms : **[6]**

i) Data compression.

ii) Rate distortion function.

b) Show that Shanon's limit for an AWGN channel is equal to –1.6 db in the information capacity theorem. **[10]**

OR

Q4) a) Explain sphere packing problem in the information capacity theorem. **[8]**

b) Explain M-ary PSK & M-ary FSK system with reference to Shanon's limit. **[8]**

Q5) a) What is meant by burst? How burst error correction takes place? Explain with suitable example. **[6]**

b) For a systematic linear block code, 3 parity check bits are given by C_4, C_5, C_6 **[12]**

$C_4 = d_1 \oplus d_2 \oplus d_3$

$C_5 = d_1 \oplus d_2$

$C_6 = d_1 \oplus d_3$

i) Construct a Generator Matrix.

ii) Construct code generated in this matrix.

iii) Determine error correcting capability.

iv) Prepare a decoding table.

v) Decode the received word

101100 and 000110

OR

Q6) a) i) Explain features of Golay codes. **[4]**

ii) Comment on error detection capability of CRC codes. **[4]**

b) Find a generator polynomial g(x) for a systematic (7, 4) cyclic code and find the code vectors for the following data vectors 1010, 1111, 0001, 1000 given $x^7 + 1 = (x + 1)(x^3 + x + 1)(x^3 + x^2 + 1)$ **[10]**

SECTION - II

Q7) a) A Rate 1/3 convolution encoder has generating vectors as $g_1 = 100$, $g_2 = 111$, $g_3 = 101$ **[12]**

i) Sketch the encoder

ii) Draw the state diagram and trellis diagram.

iii) If input message sequence is 10110 determine the output sequence of the encoder.

b) Explain the necessity of inter leaver in turbo codes. **[6]**

OR

Q8) a) Explain viterbi algorithm with suitable example. **[8]**

b) Explain : **[5]**

i) Distance Bound.

ii) Performance bound related to convolution codes.

c) Explain types of Error control. **[5]**

Q9) a) Find minimal polynomial of GF(2^3) whose transfield is GF(2) with permittive polynomial $x^3 + x + 1$. **[8]**

b) State note on : **[8]**

i) JPEG.

ii) An optimal modulation system.

OR

Q10)a) What is Cryptography technique. Explain secret key Cryptography technique in detail. **[8]**

b) What is Reed soloman code? Compare it with BCH code with relevant example. **[8]**

Q11)a) Compare TDMA, FDMA, CDMA, and SDMA wireless communication system. **[8]**

b) Explain various Kepler's law with respect to satellite communication. **[8]**

OR

Q12)a) i) Write short note on cell splitting in mobile communication. **[4]**

ii) Explain the terms : **[4]**

1) Frequency leuse.
2) Hand off.
3) Cluster.

b) For a satellite earth station receiver with equivalent noise temp. of 200°k, a noise band width of 18MHz and a receiving Antenna gain of 50db. determine gain to equivalent noise temperature ratio, noise density and total noise power, **[8]**

Assume carrier frequency of 12 GHz kate (10.75).

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Total No. of Questions : 12]

P1506

SEAT No. : ____

[Total No. of Pages : 6

[4163] - 102
T.E. (Petrochemical)
MATHEMATICS FOR PETROCHEMICAL ENGINEERS
(2003 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section - I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Determine all basic feasible solutions to the system of equations. **[6]**

$$x_1 + 2x_2 + x_3 = 4$$
$$2x_1 + x_2 + 5x_3 = 5$$

b) Solve the following LPP problem using simplex method : **[10]**

Max Z = $x_1 + x_2 + 3x_2$

Subject to constraints :

$$3x_1 + 2x_2 + x_3 \leq 3$$
$$2x_1 + x_2 + 2x_3 \leq 2$$
$$x_1, x_2, x_3 \geq 0$$

OR

Q2) a) Write the dual of the following LP problem : **[6]**

maximize Z = $2x_1 + 3x_2 + x_3$

Subject to the constraints

$$4x_1 + 3x_2 + x_3 = 6$$
$$x_1 + 2x_2 + 5x_3 = 4$$
$$x_1, x_2, x_3 \geq 0$$

P.T.O.

b) A firm produces 3 products A, B, C. The profits are Rs. 3, Rs. 2 and Rs. 4 respectively. The firm has 2 machines and below is the required processing time in minutes for each machine on each product. **[10]**

	Product A	B	C	Machine Minutes available
Machine G	4	3	5	2000
H	2	3	4	2500

Firm must manufacture 100 A's, 200 B's and 50 C's. Formulate the problem as LPP for maximum profit.

Q3) a) Solve the following assignment problem for minimum time, where the time required by each job on each machine is as follows : **[6]**

Job / Machine	I	II	III	IV	V
A	3	5	10	15	8
B	4	7	15	18	8
C	8	12	20	20	12
D	5	5	8	10	6
E	10	10	15	25	10

b) Solve the following transportation problem for minimum cost, using vogel's Approximation method : **[10]**

		Destinations D_1	D_2	D_3	D_4	Availability
Origins	O_1	1	2	1	4	30
	O_2	3	3	2	1	50
	O_3	4	2	5	1	20
Requirement		20	40	30	10	

OR

Q4) a) Solve the following assignment problem for minimum cost where the operating cost of each job on each mach is as follows : **[6]**

Jobs

		1	2	3	4
Machine	A	10	12	19	11
	B	5	10	7	8
	C	12	14	13	11
	D	8	15	11	9

b) Use Vogel's Approximation method to find the optimal solution of the following transportation problem : **[10]**

Destinations

		D_1	D_2	D_3	Availability
Source	1	8	6	5	150
	2	6	6	6	150
	3	10	8	4	150
	4	8	6	4	150
Requirement		200	200	200	

Q5) a) Following are the values of import of raw material and export of finished product in suitable units. Calculate the coefficient of correlation between them. **[7]**

Export	10	11	14	14	20	22	16	12	15	13
Import	12	14	15	16	21	26	21	15	16	14

b) An unbiased coin is thrown 10 times find the probability of getting **[6]**

i) exactly 6 heads

ii) atleast 6 heads

c) In a Poisson Distribution if **[5]**

$p(r = 1) = 2p(r = 2)$

Find $p(r = 3)$

OR

Q6) a) Find the lines of regression for the following data : **[7]**

x	10	14	19	26	30	34	39
y	12	16	18	26	29	35	38

b) In a certain examination test, 2000 students appeared in a subject of statistics. Average marks obtained were 50% with standard deviation 5%. How many students do you expect to obtain more than 60% of marks, assuming that marks are normally distributed. **[5]**

Given Z = 2

area = 0.4772

c) A nationalized bank utilizes four windows to render fast services to the customers, on a particular day, 800 customers were observed. They were given services at different windows as follows. Test whether the customers are uniformly distributed over windows. **[6]**

Window No.	Expected No. of customers
1	150
2	250
3	170
4	230

Given χ^2_3, 0.005 = 7.815

SECTION - II

Q7) a) With usual notations prove the following : **[8]**

i) $\mu = \dfrac{2+\Delta}{2\sqrt{1+\Delta}}$

ii) $\delta = \Delta\,(1+\Delta)^{-1/2} = \nabla\,(1-\nabla)^{-1/2}$

b) Find the value of $\int_0^{\pi/2} \sqrt{(1-0.162\sin^2 x)}\,dx$ using simpson's one-third rule taking $h = \dfrac{\pi}{12}$. **[9]**

OR

Q8) a) Determine by Lagrange's method the percentage number of patients over 40 years using the following data : **[8]**

Age over (x) yrs	30	35	45	55
% no. of patients	148	96	68	34

b) Find the first and second derivatives of $y = f(x)$ at $x = 1.5$ from the following data : **[9]**

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.0	13.625	24	38.875	59.0

Q9) a) Find the root of the equation $x^3 - 5x - 7 = 0$ that lies between 2 and 3 by the method of false position. **[8]**

b) Solve the following system of equations by Guass elimination method. **[9]**

$x + 2y + 3z + 4u = 10$
$7x + 10y + 5z + 2u = 40$
$13x + 6y + 2z - 3u = 34$
$11x + 14y + 8z - u = 64$

OR

Q10)a) Solve the following system of equations by Guass-Seidel's method. **[9]**

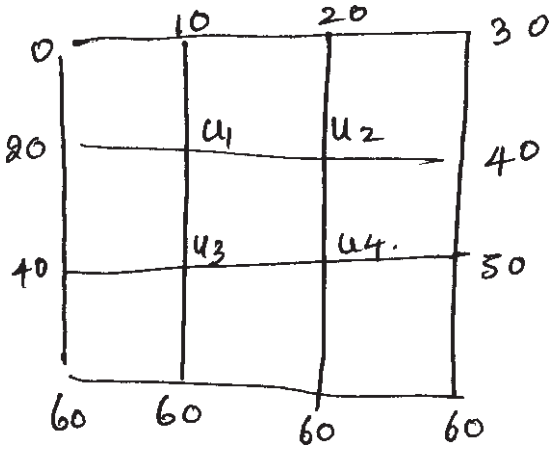
$30x - 2y + 3z = 75$
$x + 17y - 2z = 48$
$x + y + 9z = 15$

b) Find the equation of best fitting straight line to the following data. **[8]**

x	0	5	10	15	20	25	30
y	10	14	19	25	31	36	39

Q11)a) Use Runge-Kutta method of fourth order to obtain the numerical solutions of $\frac{dy}{dx} = x^2 + y^2$ $y(1) = 1.5$.
in the interval (1, 1.2) with h = 0.1 or find $y(1.2)$. **[8]**

b) Solve $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ at the nodal points of square grid using the boundary values indicated. **[8]**



OR

Q12)a) Use Euler's modified method to find the value of y satisfying the equation $\frac{dy}{dx}$ = log $(x + y)$ y (1) = 2 for x = 1.2 and x = 1.4 and h = 0.2. **[8]**

b) Solve the poisson equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}$ = – 4(x^2 + y^2) over the square mesh with sides x = 0, y = 0, x = 3, y = 3 with μ = 0 on the boundary and mesh length 1 (h = 1, k = 1). **[8]**

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Total No. of Questions : 12]

P984

SEAT No. : ____

[Total No. of Pages : 3

[4163] - 51
T.E. (Electronics/E & TC)
DIGITAL DESIGN AND COMPUTER ORGANIZATION
(2003 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different types of hazards encountered in combinational and sequential circuits. How to eliminate these hazards? **[6]**

b) Write down the steps for designing of asynchronous FSM. **[2]**

c) Draw an ASM chart for the FSM given in fig. 1. **[8]**

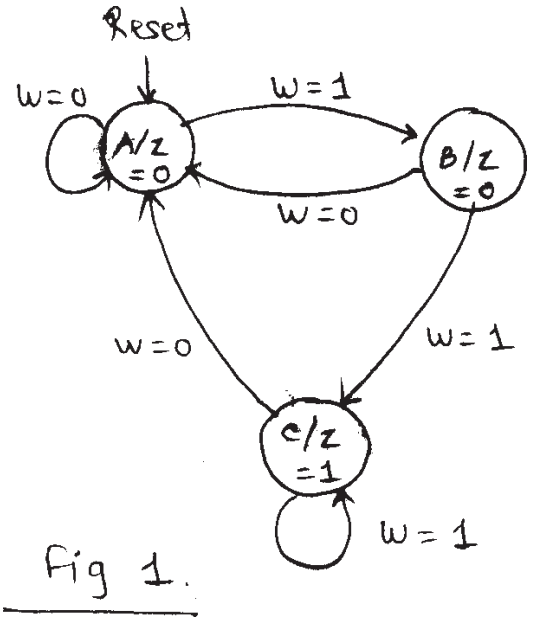

Fig 1.

Where A, B, C are the states, W is the input and Z is the output.

OR

P.T.O.

Q2) a) Analyze gated D latch as an asynchronous circuit constructed with NAND gates. **[8]**

b) Compare Moore and Mealy types of state machines with the help of block diagram and suitable example. Also state the advantages and disadvantages of state machines described with state diagrams compared to ASM charts, truth table and karnaugh map. **[8]**

Q3) a) Explain the difference between signal and variable. **[4]**

b) Explain entity and architecture. **[4]**

c) Write VHDL code for 3:8 decoder. **[4]**

d) Explain synthesis and implementation. **[4]**

OR

Q4) a) Write VHDL code for 4-bit up counter with reset input. **[8]**

b) Explain different modeling styles of VHDL. **[8]**

Q5) a) Solve using Booth's algorithm and bit pair recoding technique, $(+ 14)_{10} \times (-5)_{10}$ **[8]**

b) Perform non-restoring division of following, **[10]**

Dividend = 1010

Divisor = 0011

Also state merits and demerits of non-restoring division.

OR

Q6) a) Explain different IEEE standards for representing floating point numbers. **[8]**

b) Represent the following in single precision format **[6]**

i) –1.5 ii) 15

c) What are the rules to perform multiplication and division of floating point numbers. **[4]**

SECTION - II

Q7) a) Explain with suitable example execution of a complete instruction using single bus organization. **[12]**

b) Differentiate between stack and queue. **[4]**

OR

Q8) a) Explain following addressing modes with suitable examples. **[12]**

i) Immediate addressing mode.

ii) Direct addressing mode.

iii) Indirect addressing mode.

iv) Register addressing mode.

v) Index mode.

vi) Auto increment mode.

b) Explain the role of stack in execution of subroutines. **[4]**

Q9) a) Explain an interrupt instructure with suitable example (any processor). **[8]**

b) Explain memory mapped I/O and I/O mapped I/O. **[8]**

OR

Q10)a) List out different system buses along with their features. **[8]**

b) Explain different bus arbitration methods. **[8]**

Q11)a) Explain the concept of virtual memory. How virtual address is translated to physical address? **[8]**

b) Explain different types of RAMs in detail. **[6]**

c) Explain memory hierarchy. **[4]**

OR

Q12)a) With respect to cache memory explain the following **[8]**

i) Write through policy.

ii) Write back policy.

b) Explain with suitable diagram, interleaving of memory. **[5]**

c) What are performance considerations? **[5]**

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Total No. of Questions : 12]

SEAT No. : ____

P1000

[Total No. of Pages : 4

[4163] - 80

T.E. (Printing Engg.)

THEORY OF PRINTING MACHINES & MACHINE DESIGN

(2003 Pattern) (Sem. - II)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from section I and 3 questions from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain the term Path of approach, path of recess and path of contact between two mating gears. **[6]**

b) Two involute gears with number of teeth 28 and 45 are in mesh. If they have standard addendum (a = 1m) and pressure angle is 20^{o}. Find the following:

i) Path of approach
ii) Path of recess
iii) Contact ratio
iv) Angle of approach for pinion if pinion is driver.

Assume module = 3mm. **[10]**

OR

Q2) a) What do you mean by undercutting and interference in involute gears. **[8]**

b) Compare Involute gear tooth profile with the cycloidal profile. **[8]**

Q3) a) What do mean by gear Torque and tooth load in epicyclic gear train. **[10]**

b) Explain the tabular method for obtaining the velocity ratio of epicyclic gear train? **[6]**

P.T.O.

OR

Q4) Gear wheel A having 14 teeth is rigidly mounted on the driving shaft. It gears with compound wheel B-D. B gears with fixed annular wheel C and D gears with annular wheel E. The compound wheel B-D, revolves freely on a pin. The annular wheel E is rigidly mounted on the driven shaft.

Modules of all gears are same. The driving shafts and the annular wheels are coaxial. Number of teeth on gear C, E and D are 100, 98, 41. Driving shaft rotates at 1000 rpm and transmits 20 kW power. **[16]**

a) Sketch the arrangement.

b) Find the speed of driven shaft.

c) Find the torque transmitted by the driven shaft.

Q5) Draw the profile of a cam operating a flat face follower reciprocating follower and with the following data:

Minimum radius of cam = 40 mm, Lift = 35mm,

The cam lifts the follower for 90º with SHM followed by a dwell period of 60º. Then the follower lowers down during 150º of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 300 rpm, calculate the maximum velocity and acceleration of the follower during the descent period. **[18]**

OR

Q6) The following data relates to a cam operating an oscillating roller follower:**[18]**

Minimum radius of cam = 30 mm

Radius of roller = 10 mm

Length of follower arm = 45 mm

Distance of fulcrum centre from cam centre = 550mm

Angle of ascent = 80º

Angle of descent = 120º

Angle of dwell at maximum lift = 50º

Angle of oscillation of follower = 28º

Draw the cam profile. Assume follower follows SHM for both outstroke and return stroke.

SECTION - II

Q7) a) A transmission shaft of cold drawn steel 27 Mn^2 (Sut = 500 N/mm^2 and Syt = 300 N/mm^2) is subjected to a fluctuating torque which varies from -100 N-mm to + 400 N-mm. The factor of safety is 2 and the expected reliability is 90%. Neglecting the effect of stress concentration, determine the diameter of the shaft.

Take Ka = 0.8, Kb = 0.85, Kc = 0.897

Assume the distortion energy theory of failure. **[8]**

b) Explain the effect of following modifying factors on endurance strength: **[8]**

i) Surface finish factor

ii) Size factor

iii) Reliability factor

iv) Modifying factor to account stress concentration.

OR

Q8) a) What is Stress concentration? What are its causes and explain the methods of reducing stress concentration. **[8]**

b) Explain the terms with neat sketches: **[8]**

i) Soderberg diagram

ii) Modified Goodman diagram.

Q9) A spur pinion having 20 teeth is to mesh with a gear having 43 teeth. The pinion and gear are to be made of plain carbon steels having ultimate tensile strengths of 600 N/mm^2 and 400 N/mm^2 respectively. The pinion is to be driven by a three phase induction motor having a speed of 1440 r.p.m. and 10 kW rating. The starting torque of the motor is twice the working torque. If the surface hardness of the gear pair is to be 400 BHN, design a gear pair with a factor of safety of 1.5.

Assume velocity factor accounts for the dynamic load.

Assume 20^o full depth involute tooth system.

Y = 0.484 - (2.87/Z) and b = 10 m

First choice of std. modules in mm recommended by ISO:

1, 1.25, 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 32, 40.

$K = 0.16 [BHN/100]^2$ $K_a = 2$ and $K_m = 1$ **[18]**

OR

Q10)a) Explain the Equivalent spur gear and virtual number of teeth related to helical gear. **[8]**

b) Derive the relationship for the beam strength of a helical gear pair. **[10]**

Q11)a) Explain bearing life with the help of graph of percentage bearings in operation Vs the bearing life. **[10]**

b) Explain the procedure of selection of bearing from manufacturer's catalogue. **[6]**

OR

Q12)a) A deep-groove ball bearing having bore diameter of 60 mm and rotating at 1440 rpm is subjected to a radial force of 2000 N and an axial force of 1000 N. The radial and thrust factors are 0.56 and 2.0 respectively. The load factor is 1.2. If the expected rating life is 25000 hours, calculate the required basic dynamic capacity of the bearing. **[8]**

b) Describe with neat sketches, the different types of rolling contact bearings. **[8]**

Total No. of Questions : 12]

SEAT No. : ____

P1001

[Total No. of Pages : 4

[4163] - 81

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) The dynamics of a process is given by **[12]**

$$\frac{dx_1}{dt} = 5x_1 + 2x_2 + 2x_3$$

$$\frac{dx_2}{dt} = 3x_1 + 6x_2 + 3x_3$$

$$\frac{dx_3}{dt} = 6x_1 + 6x_2 + 9x_3.$$

Find eigenvalues and eigenvectors of linear matrix A if system of equation is represented as $\frac{dx}{dt} = Ax$ where $x = (x_1, x_2, x_3)$

b) Consider system of equations. **[6]**

$2x_1 - x_2 = 7$

$-x_1 - 2x_2 - x_3 = 1$

$-x_2 + 2x_3 = 1$

Use Gauss - Seidel method and perform three iterations.

P.T.O.

OR

Q2) a) State the convergence criteria for the Gauss Seidel method. **[9]**

b) State and explain three categories in which systems of linear algebric equations can be classified. **[9]**

Q3) a) In a chemical process water vapour is heated to sufficient high temperature where sufficient portion of water dissociates to form O_2 and H_2 as **[10]**

$$H_2O \rightleftharpoons H_2 + \frac{1}{2} O_2$$

It is assumed that, this is only reaction involved, the mole fractions of H_2O (x) that dissociates can be represented by

$$K_p = \frac{x}{1-x}$$

where K_p = reaction constant = 0.04568

P_t = total pressure = 2 atm

Determine the values of x that satisfy the above equation by using Newton Raphson method. $\sqrt{\frac{2p_t}{2+x}}$

b) Explain three error sources in computations. **[6]**

OR

Q4) a) Explain the graphical interpreation of Euler's method. **[8]**

b) The table below shows temperature as a function of time **[8]**

t	1	2	3	4	5	6	7
T	81	75	80	83	78	70	60

Where t denotes time and T denotes Temperature. Use Simpsons $\frac{3}{8}$ rule to estimate $\int_1^7 f(t)\,dt$.

Q5) Solve $\frac{d^2y}{dx^2} + y = 0$ with boundry conditions y = 0 when $x = 0$, $y = 0$ when $x = 1$. Find y at $x = 0.5$ **[16]**

OR

Q6) a) Using the finite difference method solve the boundry value problem.

$$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}=1$$

With $y(1) = 0$, $y(1.4) = 0.05666$

Find $y(1.1)$, $y(1.2)$ and $y(1.3)$ **[10]**

b) What are different types of boundry conditions applied to partial differential equation. **[6]**

SECTION - II

Q7) a) Fit a curve $y = ax^b$ using following data

x	2000	3000	4000	5000	6000
y	15	15.5	16	17	18

Find the values of a and b **[8]**

b) Explain the principle of least square method to show the sum of the squares of residual is minimum. **[8]**

OR

Q8) a) Fit a parabola to the following data using the method of least squares. **[8]**

x	1.0	1.2	1.4	1.6	1.8	2.0
y	0.98	1.40	1.86	2.55	2.28	3.20

b) What are the quantification of error in linear regression. **[8]**

Q9) a) Explain vector and Tensor components in curvilinear co-ordinates. **[8]**

b) Show that $\frac{\partial Ap}{\partial x^2}$ is not a tensor eventhougth Ap is a covarient tensor of rank one. **[8]**

OR

Q10)a) State the fundamental operations with tensors. **[8]**

b) Show that the velocity of a fluid at any point is a contravarient tensor of rank one. **[8]**

Q11)a) What is process optimization and state different methods of optimization. **[6]**

b) Maximize $Z = 500\,x_1 + 600x_2$

Subject to conditions

$$x_1 + 2x_2 \leq 15$$

$$3x_1 + 2x_2 \leq 18$$

$$x_1, x_2 \geq 0$$

Find the optimal solution and maximum value of Z. **[12]**

OR

Q12)a) Maximize $Z = 14x + 20y$ **[12]**

Subject to condition

$$20x + 6y \leq 1000$$

$$40x + 8y \leq 500$$

$$x, y \geq 0$$

b) State the applications of optimization and explain one in short. **[6]**

Total No. of Questions : 12]

SEAT No. : ____

P1002

[Total No. of Pages : 4

[4163] - 82

T.E. (Chemical)

MASS TRANSFER - I

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) In an O_2-N_2 gas mixture at 1 std atm, and 25ºC, the concentrations of oxygen at two planes 2 mm apart are 10 and 20 vol.% respectively. Calculate the flux of diffusion of the oxygen for the case where: **[12]**

i) The N_2 is nondiffusing.

ii) There is an equimolar counterdiffusion of the two gases.

$D_{AB} = 1.81 \times 10^{-5}$ m^2/sec

What is percentage change in flux if total pressure is doubled?

b) Compare molecular diffusion with eddy diffusion. **[4]**

OR

Q2) a) Calculate the rate of diffusion of acetic acid (A) across a film of nondiffusing water (B) solution 1 mm thick at 17ºC when the concentrations on opposite sides of the film are 9 and 3 wt % acid respectively. The diffusivity of acetic acid in the solution is 0.95×10^{-9} m^2/sec. At 17ºC density of the 9 and 3 wt % solutions is 1012 and 1003.2 kg/m^3, respectively. **[8]**

P.T.O.

b) i) Compare direct contact of two immiscible phases with direct contact of miscible phases. **[4]**

ii) Explain different characteristics of mass transfer operation that will influence on the methods of conducting the mass transfer operations.**[4]**

Q3) a) Derive Reynald's analogy between heat, mass and momentum Transfer.**[8]**

b) Explain the concept of interphase mass transfer and derive an expression relating local and overall mass transfer co-efficient. **[8]**

OR

Q4) In a wetted wall column there is absorption of SO_2 by means of water which is flowing down as a thin liquid film on the inside surface of the column. SO_2-air mixture is flowing from bottom to top of the column. The equilibrium relation at given separating conditions as follows:

xso_2	0.07	0.21	0.285	0.33	0.385
yso_2	0.03	0.12	0.20	0.275	0.42

SO_2 composition in main gas stream is 0.37 mol fraction, that in main liquid stream is 0.13 and equilibrium composition at fixed conditions of temperature and pressure are 0.2 and 0.285 respectively in gas and liquid phase. Determine an individual mass transfer coefficient for liquid and overall mass transfer coefficient. Also determine the mass transfer flux. $K_y = 1.47 \times 10^{-3}$ **[16]**

Q5) The equilibrium partial pressure of CO_2 over aqueous solutions of ethanolamine (30%) are: **[18]**

mol CO_2/mol solution	0.058	0.06	0.062	0.064	0.066	0.068	0.07
Partial pressure of CO_2 (mm Hg) at 25ºC	5.6	12.8	29.0	56.0	98.7	155	232

A plant manufacturing dry ice will burn coke in air to produce a flue gas which, when cleaned and cooled, will contain 15% CO_2, 6% O_2, and 79% N_2. The gas will be blown into a sieve tray tower scrubber at 1.2 std atm, 25 ºC, to be scrubbed with a 30% ethanolamine solution entering at 25 ºC. The scrubbing liquid, which is recycled from a stripper, will contain 0.058 mol CO_2/mol solution. The gas leaving the scrubber is to contain 2% CO_2. Assume isothermal operation.

a) Determine the minimum liquid/gas ratio, mol/mol.

b) Determine the number of theoretical trays for an L/G ratio of 1.2 times the minimum.

The specific gravity of the solution is 1.012.

OR

Q6) a) What is minimum liquid-gas ratio for absorbers? How it is determined and Explain its significance during the design of absorption column. **[8]**

b) Starting from basic principles derive Kremser-Brown-Souders (or simply Kremser) equation to calculate the number of theoretical plates for gas absorption. **[10]**

SECTION - II

Q7) a) Explain web bulb temperature and derive $t_G - t_w = \dfrac{\lambda_w (Y'_w - Y')}{h_G / k_y}$ **[10]**

b) Explain the term 'Lewis Relationship' **[6]**

OR

Q8) a) Derive the relation $t_{G1} - t_{as} = \dfrac{(Y'_{as} - Y')}{C_{s1}}$ for adiabatic saturation curve. **[8]**

b) The DBT and WBT of air are found to be 30°C and 20°C respectively. By using humidity chart calculate: **[8]**

i) Absolute humidity ii) Molar Humidity

iii) % Relative Humidity iv) %Saturation

v) Humid Volume

Q9) a) Explain about multistage absorption towers with neat sketches and Explain certain design features generally used in tray design. **[10]**

b) Give brief regarding the pressure drop and channelling in the packed column. **[8]**

OR

Q10)a) Explain Proprietary Trays with neat sketches. **[8]**

b) Compare Point efficiency with Murphree tray efficiency. **[6]**

c) Write a note on 'Entrainment'. **[4]**

Q11)a) Explain different zones in the continuous countercurrent dryer with sketch. **[6]**

b) An uninsulated, hot air countercurrent rotary dryer is to be used to dry ammonium sulphate from 3.5 to 0.2% moisture (wet basis). The dryer is 1.2 m in diameter, 6.7 m long. Atmospheric air at 25ºC, 50% humidity, will be heated by passage over steam coils to 90 ºC before it enters the dryer and is expected to be discharged at 32 ºC. The solid will enter at 25 ºC and is expected to be discharged at 60ºC. Product will be delivered at a rate of 900 kg/h. Estimate the air and heat requirements for the dryer. The heat capacity of dry ammonium sulphate is C_s = 1507 and that of water 4187 J/kg. K. The estimated combined convection and radiation heat transfer coefficient from dryer to surrounding is 12 W/m^2.K. **[10]**

OR

Q12)a) Derive to calculate total drying time. **[8]**

b) A batch of the solid is to be dried from 25 to 6% moisture (on wet basis). The initial weight of the weight solid is 160 kg and the drying surface is 1 m^2/40 kg dry weight. Determine the total time for drying. X_C = 0.2 (dry basis) **[8]**

$$t_T = \frac{L_s}{AN_C}\left[(X_1 - X_C) + (X_C - X^*)\ln\left(\frac{(X_C - X^*)}{(X_2 - X^*)}\right)\right]$$

X	0.2	0.18	0.16	0.14	0.12	0.1	0.09	0.08	0.07	0.064
10^3N	0.3	0.266	0.239	0.208	0.18	0.15	0.097	0.07	0.043	0.025

Total No. of Questions : 12]

SEAT No. : ____

P1003

[Total No. of Pages : 3

[4163] - 83

T.E. (Chemical)

PROCESS INSTRUMENTATION AND INSTRUMENTAL ANALYSIS

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from section I and 3 questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define Instrumentation and explain the purpose of instrumentation in Chemical process industries. **[6]**

b) Distinguish between self operated and power operated instruments. **[4]**

c) What is calibration? State methods for calibrating the instruments. **[8]**

OR

Q2) a) Explain static and dynamic characteristics of measuring instruments. **[8]**

b) Evaluate the temperature at which Fahrenheit and Centigrade Scale coincide. **[6]**

c) Explain the importance of Instrumentation the process industries. **[4]**

Q3) a) Describe the operating principle, construction and working of optical pyrometer. **[8]**

b) Explain working of Industrial mercury in glass thermometer, with the help of a neat diagram. **[8]**

OR

P.T.O.

Q4) a) Write Short notes on. **[8]**

i) Liquid filled thermometer ii) RTD

b) Explain Seebeck effect and its application in working of a temperature measuring instrument. Name the instrument with its working diagram.**[8]**

Q5) a) Enumerate the desirable characteristics of manometric liquids. Name some of the manometric liquids and point their fields of application, advantages and limitations. **[10]**

b) Explain inclined leg manometer. **[6]**

OR

Q6) a) Explain any one type of high pressure sensor in detail. **[8]**

b) Explain construction and working of Pirani vacuum gauge. **[8]**

SECTION - II

Q7) a) Explain the principle, construction and working of Venturi meter. **[8]**

b) Describe with the help of a neat diagram, construction and working operation of pitot static probe. **[8]**

OR

Q8) a) Describe the principle, construction and working of Electromagnetic flow meter. **[10]**

b) Describe Vena Contracta in orifice. **[6]**

Q9) a) Explain construction and working of Air purge method and its application. **[8]**

b) Write short notes on. **[8]**

i) Dip Stick method ii) Diaphragm box method

OR

Q10)a) Explain with neat diagram Air trap system for liquid level measurement.**[8]**

b) What are the objectives to use of Sight Glass and float Glass for level measurement? **[8]**

Q11)a) Describe various viscosity measuring devices. **[8]**

b) Explain Chromatography in detail. **[10]**

OR

Q12)Write short notes on: **[18]**

a) Emission spectroscopy

b) Mass Spectroscopy

c) Conductivity Cell

d) I.R. Absorption Spectroscopy.

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Total No. of Questions : 12]

SEAT No. : ____

P1004

[Total No. of Pages : 4

[4163] - 84

T.E. (Chemical)

PROCESS EQUIPMENT DESIGN - I

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from section I and three questions from section II.***
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3) ***Neat diagrams must be drawn wherever necessary.***
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SECTION - I

Q1) a) Explain the selection of gasket & bolt design. **[8]**

b) The pressure vessel has inside diameter 1450 mm and a plate thickness of 4.5 mm. The inside diameter of flange is 1480mm. A gasket is provided over the flange face. Gasket factor is 2.0 and gasket seating stress is 120 kg/cm^2. ID of gasket is 1483mm. Pressure inside the vessel is 2.7 kg/cm^2, permissible stress in bolts under atmospheric condition is 600 kg/cm^2. Permissible stress in bolts at operating condition is 550kg/cm^2. Diameter of bolt is 20 mm. Calculate: **[10]**

i) The bolt load

ii) Bolt area

iii) Flange thickness.

OR

Q2) a) Explain the design and types of heads with neat diagrams. **[8]**

b) Using shear strain energy theory criterion, calculate the equivalent stress if the shell (cylindrical) is subjected to combined loadings. **[10]**

P.T.O.

Q3) A multilayer vessel having an inside diameter 30cm and an outside diameter 59cm has been formed by shrink fitting. The vessel is to operate under an internal pressure of 1330 kg/cm^2 and is constructed of three shells. The interface diameters are 37.5 cm and 46.8 cm respectively. Determine the

a) Maximum combined stresses at the interfaces of the concentric shells.

b) The hoop stress variation in each of the three shells. **[16]**

OR

Q4) a) Explain the various stresses induced in the cylindrical shell of the skirt support. **[8]**

b) A tall vertical vessel 1.4m in diameter and 12.8 m high is to be provided with the skirt support. Weight of the vessel with all its attachment is 80,000 kg. Diameter of the skirt is equal to the diameter of vessel. Height of the skirt is 2.3m. Wind pressure acting over the vessel is 100 kg/m^2. Seismic coefficient is 0.08m, permissible tensile stress of skirt material is 960 kg/m^2, permissible compressive strength is $\frac{1}{3}^{rd}$ yield stress of material. Yield stress is 24000 kg/cm^2. Estimate the thickness of skirt support. **[8]**

Q5) a) Explain in detail the design procedure for a saddle support. **[8]**

b) Explain various types of roofs used for storage vessels. **[8]**

OR

Q6) a) Discuss various types of losses during storage of volatile liquids. **[8]**

b) Explain detailed design procedure for design of cylindrical storage vessel with cone roof. **[8]**

SECTION - II

Q7) 13000kg/hr of water available at 95ºC is to be cooled to 48ºC in a shell and Tube Heat Exchanger. This heat is to be utilized for preheating of water from 16ºC to 46ºC. Cold water is to be circulated through the tubes, while hot water on shell side. Tubes of ID 20mm are to be used and the maximum velocity through the tubes should not be more than 0.55 m/sec. Due to space limitations the tube length is to be restricted to 3.2m. Overall heat transfer coefficient for heat exchanger is 1460 W/m^{2}K. Fouling resistance and metal wall resistance may be neglected. Suggest a suitable design for the shell and Tube heat exchanger. **[16]**

OR

Q8) a) Discuss the fouling of plate heat exchanger. **[6]**

b) Estimate the size needed for a counter current Bayonet heat exchanger and estimate the cooling water rate required. Data given is:

Inlet and outlet temperature of hot fluid.

$T_1 = 232^oC$ & $T_2 = 176^oC$

Inlet and outlet temperature of cold fluid.

$t_1 = 140^oC$ & $t_2 = 154^oC$

ID of inner tube = 2.54cm

OD of outer tube = 5.08cm

Heat capacity of hot fluid = 2594 J/kg^oC

Heat capacity of cold fluid = 2427 J/kg^oC

Overall heat transfer coefficient of inner tube = $114 \frac{W}{m^{2o}C}$

Overall heat transfer coefficient of outer tube = $57 \frac{W}{m^{2o}C}$

Overall flow rate of hot fluid = 0.279 kg/sec. **[10]**

Q9) 4kg/sec of liquid with 10% solids available at 21^oC is to be concentrated to 50% solids. The vacuum can be used at 13.3 kN/m^2. BPR of the solution can be neglected. The heat capacity of solution = 4180 J/kg K.

Temperature of steam at 205 kN/m^2 = 121^oC

Temperature of vapor at 13.3 kN/m^2 = 52^oC

Latent heat of steam at 52^oC = 2377 kJ/kg

Latent heat of steam at 121^oC = 2200 kJ/kg

OD of the tube = 75mm

Length of the tube = 2.0m

Down-comer area = 70% of the total cross-sectional area. Arrangement of the tubes are square pitch with centre to centre distance equal to 1.25 times the OD of tube. Design the evaporator as triple effect with backward feed arrangement. Overall heat transfer coefficients.

are $\rightarrow$ $U_1 = 2500$ W/m^{2}K

$U_2 = 2000$ W/m^{2}K

$U_3 = 1600$ W/m^{2}K **[16]**

OR

Q10) Ammonia vapors are to be condensed at 1500kN/m^2. Saturation temperature of ammonia vapors is 42ºC, flow rate of vapors = 0.3 kg/sec. Water is available at 28ºC. 25mm OD tubes are arranged on triangular pitch of 31mm and 5m in length are available.

Overall heat transfer coefficient for condensing ammonia vapors = 1000 to 2500 W/m^2K. Properties of liquid ammonia:

Density = 600 kg/m^3,

Viscosity = 0.085×10^{-3} N.Sec/m^2.

Thermal conductivity = 0.502 W/mK.

Fouling factor on ammonia side = 0.0002 $[W/m^2K]^{-1}$

Fouling factor on water side = 0.0004 $[W/m^2K]^{-1}$

Latent heat of ammonia vapors = 1092 kJ/kg

Properties of water: Density = 1000kg/m^3.

Viscosity = 0.7×10^{-3} N.sec/m^2,

Thermal conductivity = 0.63 W/mk.

Design 1:4 type shell and tube heat exchanger. **[16]**

Q11) a) With neat sketch, explain plate and frame filter press. **[9]**

b) Explain the working of a Basket type centrifuge with a neat sketch. **[9]**

OR

Q12) a) How filters are classified? Explain the working of a rotary drum filter with a neat sketch. **[9]**

b) Explain in detail the pressure filters and state their advantages and disadvantages. **[9]**

Total No. of Questions : 12]

SEAT No. :

P1005

[Total No. of Pages : 4

[4163] - 85

T.E. (Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS-II

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various methods of determination of partial molar properties. **[8]**

b) For N_2 gas, compressibility factor is the function of pressure and it is given by

$Z = 1 - 0.36 \times 10^{-2}P$.

Calculate fugacity of N_2 gas at 10 and 50 atm. **[8]**

OR

Q2) a) What are the characteristics of an ideal solution what is Lewis-Randall rule? **[8]**

b) Show that the fugacity of a gas obeying vanderwaals equation of state is given by **[8]**

$$\ln f = \frac{b}{V-b} - \frac{29}{RTV} + \ln\frac{RT}{V-b}$$

where a and b are vanderwaals constants.

P.T.O.

Q3) a) The excess Gibbs free energy is given by

$$\frac{G^E}{RT} = -3x_1 x_2 (0.40x_1 + 0.5x_2)$$

Find expressions for ln x_1 and ln x_2 **[10]**

b) For a binary mixture of A and B, activity coefficient data for A is available over the entire composition range while only one point data is available for B. Show how would you determine the activity coefficient for B over the entire range of composition. **[8]**

OR

Q4) Chloroform and ethanol (2) forms an azeotrope at 760 kPa and 53.5ºC and $x_1 = 0.65$ using the van Laar model calculate the VLE data at 53.5ºC At 53.5ºC $P_1^{sat} = 587$ kPa, $p_2^{sat} = 484$ kPa.

The Antoine constants are given as **[18]**

Compound	A	B	C
Chloroform	6.95465	1170.966	226.232
Methanol	8.08097	1582.271	239.726

Q5) a) For the system ethyl ethonate (1)/n-heptane (2) at 343.15_k (70ºC)

ln $x_1 = 0.95\ x_2^2$, ln $x_2 = 0.95\ x_1^2$

$P_1^{sat} = 79.80$ kPa, $P_2^{sat} = 40.50$ kPa

Calculate:

i) P and y_i for T = 70ºC, $x_1 = 0.05$

ii) P and x_i for T = 70ºC, $y_1 = 0.05$ **[12]**

b) Discuss the modified Raoults law and its assumptions. **[4]**

OR

Q6) The vapor pressures of acetone (1) and acetonitrile (2) can be evaluated by Antoine equations

$$\ln P_1^S = 14.5463 - \frac{2940.46}{T - 35.93}$$

$$\ln P_2^S = 14.2724 - \frac{2945.47}{T - 49.15}$$

Where T is in K and P is in kPa. Assuming the solution formed by these is ideal. Calculate:

a) x_1 and y_1 at 327 K and 65 kPa.

b) T and y_1 at 65 kPa and x_1 = 0.40

c) P and y_1 at 327 K and x_1 = 0.40

d) T and x_1 at 65 kPa and y_1 = 0.40

e) P and x_1 at 327 K and y_1 = 0.40 **[16]**

SECTION - II

Q7) a) The simplest expression for G^E/RT capable of predicting LLE is the one parameter equation $G^E/RT = A\, x_1\, x_2$.
Derive the equations resulting from application of this equation to LLE. **[8]**

b) Explain the liquid-liquid equilibrium diagram on a triangular coordinates for a system in which two pairs are partially soluble. **[8]**

OR

Q8) a) Derive the following expression for solid - liquid equilibrium

$$\psi_i = \exp \int_{Tmi}^{T} \frac{H_i^l - H_i^s}{RT^2} dt$$

where ψ_i = $F_i^{\rightarrow}/F_i^l$

H_i^l and H_i^s are the molar enthalpies for the species *i* in the liquid and solid phases. Tmi is the melting temperature (freezing point) of pure species *i*. **[10]**

b) Explain T X Z diagrams. **[6]**

Q9) a) Derive an expression showing the effect of temperature on equilibrium constant. **[10]**

b) A system initially containing 2 mol C_2H_4 and 3 mol O_2 undergoes the reactions

$$C_2H_4\,(g) + \frac{1}{2}\,O_2\,(g) \rightarrow <(CH_2)_2> 0\,(g)$$

$$C_2H_4\,(g) + 3O_2\,(g) \qquad 2CO_2(g) + 2H_2O(g)$$

Derive expressions for the mole fractions of the reacting species as functions of the reaction co-ordinates for the two reactions. **[8]**

OR

Q10)a) Methanol can be produced according to the reaction

$CO(g) + 2H_2(g) \rightleftharpoons CH_3OH(g)$. Estimate the degree of conversion of CO(g) into methanol at 500 K and 5 bar if

i) an equimolar mixture of CO and H_2 is fed to a reactor.

ii) Stoichiometric mixture of CO and H_2 is fed to a reactor.

iii) CO and H_2 in the ratio 1:4 enter the reactor.

At 500 K, $Ka = 4.973 \times 10^{-3}$ **[12]**

b) Explain phase rule and Duhems theorem for reacting species. **[6]**

Q11)a) Calculate the equilibrium constant at 298K for the reaction

$C_2H_4(g) + H_2O(g) \rightleftharpoons C_2H_5OH(g)$ with the help of following data. Also comment about feasibility of reaction. **[8]**

	S^o_{298}, J/mol.K	H^o_{298}, J/mol.K
$C_2H_4(g)$	220.85	48986
$H_2O(g)$	189.12	–241997
$C_2H_5OH(g)$	278.00	–238941

b) The standard heat of formation and standard free energy of formation of ammonia at 298K are – 46100 J/mol and –16500 J/mol respectively. Calculate the equilibrium constant for the reaction

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

at 500K assuming that the standard heat of reaction is constant in the temperature range 298 K 500K. **[8]**

OR

Q12)a) A feed stock of pure n-butane is cracked at 750 K and 1.2 bar to produce olefins. Only two reactions have favourable equilibrium conversions at these conditions.

$C_4H_{10} \rightleftharpoons C_2H_4 + C_2H_6$ - (I) $K_1 = 3.856$

$C_4H_{10} \rightleftharpoons C_3H_6 + CH_4$ - (II) $K_2 = 268.4$

If these reactions reach equilibrium, what is the product composition? **[10]**

b) Explain multireaction equilibrium. **[6]**

Total No. of Questions : 12]

SEAT No. : ____

P1006

[Total No. of Pages : 4

[4163] - 86

T.E. (Chemical)

CHEMICAL REACTION ENGINEERING - I

(2003 Pattern) (Sem. - II) (Common to Bio-Tech.)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from section I and 3 questions from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give detail classification of chemical Reactions useful in Reactor design with an example. **[6]**

b) Define rate of reaction. Write rate of reaction in various forms. **[6]**

c) Explain temperature dependent term of rate equation. **[6]**

OR

Q2) a) A reaction with stoichiometric equation **[6]**

$$\frac{1}{2}\,A + B \rightleftharpoons R + \frac{1}{2}\,S$$

has the following rate expression

$$-r_A = 2C_A^{0.5}C_B$$

What is the rate expression for this reaction if stoichiometric equation is written as $A + 2B \rightleftharpoons 2R + S$

b) The reaction between acetic acid and ethanol is studied in a Laboratory.

$CH_3COOH + C_2H_5OH \rightleftharpoons CH_3\,COOC_2H_5 + H_2O.$

It is observed that 0.667 moles of ester is formed when one mole of acetic acid is mixed with one mole of ethanol.Calculate the equilibrium constant for the above reaction **[8]**

P.T.O.

c) A certain reaction has a rate given by

$-r_A = 0.005\ C_A^2$ mol/cm^3.min

If the concentration is expressed in mol/lit and time in hours. What would be the value and units of rate constant. **[4]**

Q3) a) For a homogeneous first order gas phase reaction

$SO_2Cl_2 \rightarrow SO_2 + Cl_2$

The half life time is 445. Calculate the time required for the concentration of SO_2Cl_2 to be reduced to 2% of the original value. **[8]**

b) Explain the term Reactions of shifting order with an example. **[8]**

OR

Q4) a) Derive an expression for autocatalytic irreversible reaction in a batch reactor. **[8]**

b) The reaction between triethyl amine and methyl iodide is carried out with nitrobenzene as solvent at 25ºC. The reaction is second order with reaction rate constant 0.033 lit/mol-sec. Initial concentration of both the reactants is 0.02 mol/lit each. Calculate the time required for 30%, 70% and 90% conversion. How much conversion can be achieved in 30 minutes. **[8]**

Q5) a) Explain mixed flow reactors of different sizes in serises and determine the best system for a given conversion. **[8]**

b) A second order irreversible vapour phase reaction is carried out in a plug flow reactor. The reaction is represented as **[8]**

P $\rightarrow$ Q + 2C

Calculate

i) The length of plug flow reactor required for 68% conversion.

ii) The error in length calculation if volume change is neglected.

Given data: Reaction rate constant K = 4.2 lit/mol.sec.

Cross sectional area A = 150 cm^2.

Volumetric flow rate V_o = 1.3 lit.sec.

Initial concentration of *p* is C_{po} = 0.025 mol/lit.

OR

Q6) a) It is planned to operate a mixed reactor to convert A into R. This is a liquid reaction with the stoichiometry A $\rightarrow$ R. The rate equation is given in table below. What size of mixed flow reactor is needed to achieve 75% conversion of feed stream of 1000 mol of A/hr with C_{AO} = 1.2 mol/lit

C_A mol/lit	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	1.3	2.0
$-r_A$ mol/lit min	0.1	0.3	0.5	0.6	0.5	0.25	0.1	0.06	0.05	0.045	0.042

[8]

b) Describe term space time and space velocity. **[4]**

c) A vapour phase reaction with unknown kinetics is carried out in plug flow reactor. The reaction is represented as **[4]**

2A B+2C

The space velocity is 1.5 min^{-1} and the conversion achieved is 80% calculate.

i) Space time of plug flow reactor.

ii) Holding time in plug flow reactor.

SECTION - II

Q7) a) What reaction schemes and conditions would you use to have maximum concentration of R for the following parallel reactions?

A + B R (desired) $r_R = 15.e^{-273/T}$

A + B $\rightarrow$ S (undesired) $r_S = 200.e^{-2000/T}$. **[8]**

b) Write a note on concentration - time curves for the elementary reversible parallel reactions. **[10]**

$C_A^{2.5} \cdot C_B$

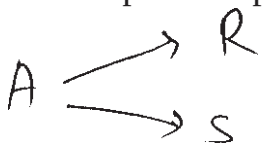
OR

Q8) a) Derive rate expression for two step irreversible serise - parallel reaction. The reactions are as follows: **[8]**

$A + B \xrightarrow{K_1} R$

$R + B \xrightarrow{K_2} S$

b) Liquid reactant A decomposes as per the following reaction scheme **[10]**



With rates

$r_R = K_1 C_A^2$ $K_1 = 0.4\ m^3/(mol.\ min)$

$r_S = K_2 C_A$ $K_2 = 2\ (min)^{-1}$

an aqueous feed containing A with $C_{AO} = 40\ mol/m^3$ enters the reactor, decomposes and a mixture of A,R and S leaves the reactor. Find the operating condition X_A, τ and C_R which maximises C_R in a mixed flow reactor.

Q9) a) The standard heat of gas phase reaction at 25ºC

$A + B \quad 2R$ is $= \Delta H_{R(298^oK)} = -50000J$

Indicating that the reaction is strongly exothermic. It is planned to run this reaction at 1000ºC. What is the value of heat of reaction at that temperature? Is reaction is still exothermic at 1000ºC? **[8]**

b) Write note on optimum temperature progression. **[8]**

OR

Q10) Determine the equilibrium conversion for the following elementary reactions between 0ºC & 100ºC. **[16]**

$A \rightleftharpoons R$

at 298°K $G^o = -14130$ J/mol. $= -75300$ J/mol

$C_{PA} = C_{PR}$ = constant

a) Construct a plot of temperature u/s conversion.

b) What restrictions should be placed on a reactor operating isothermally if conversion of 75% or higher is desired.

Q11) In order to study the residence time distribution in a CSTR operating at steady state a tracer is introduced in the feed stream. The tracer concentration in the effluent stream is monitored as a function of time and the data is tabulated as shown below **[16]**

t(sec)	0	100	200	300	460	500	670	735	840	960	1100
Tracer conc^n g/m^3	0	2.9	8.7	12.4	10	6.5	3.0	1.5	0.5	0.0	0.0

Time is measured relative to that at which tracer is injected. Calculate

a) The average residance time of fluid and F(t) curve for the system.

b) The variance of the response to the pulse input.

c) Dispersion number.

OR

Q12) Write a note on **[16]**

a) Residance time distribution (RTD)

b) Dispersion model.

Total No. of Questions : 12]

SEAT No. :

P1007

[Total No. of Pages : 2

[4163] - 88

T.E. (Chemical)

CHEMICAL PROCESS TECHNOLOGY

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe solvay process with detailed process flow diagram and reactions. Also discuss the major engineering problems involved. **[12]**

b) Compare unit operations and unit processes. **[6]**

OR

Q2) a) What are the various sea chemicals obtained from sea water? Describe the recovery process in detail. **[12]**

b) Explain production of aluminium. **[6]**

Q3) a) Explain production of phosphoric acid from phosphate rock. **[8]**

b) Explain urea production with its engineering problems. **[8]**

OR

Q4) a) Describe the process for ammonia production. **[8]**

b) Discuss the production process of sulphuric acid. **[8]**

Q5) a) Explain sugar production process. **[8]**

b) Describe absolute alcohol manufacturing process. **[8]**

P.T.O.

OR

Q6) a) Discuss production of starch derivatives. **[8]**

b) Explain procedure for paper making. **[8]**

SECTION - II

Q7) a) Describe destructive distillation of coal. **[8]**

b) Explain hydrogenation of oil. **[8]**

OR

Q8) a) Discuss the soap manufacturing process. **[8]**

b) Write a note on Inter esterification of fats. **[8]**

Q9) a) Describe the production of water gas and producer gas. **[10]**

b) Write a note on refinery operations. **[8]**

OR

Q10)a) Explain the following refinery operations.(any two) **[12]**

i) Alkylation ii) Reforming

iii) Catalytic cracking.

b) Explain how natural gas is recovered. **[6]**

Q11)Draw the process flow diagram and explain in breif. [any 4] **[16]**

a) Vinyl chloride b) Methanol

c) Cumene d) Isopropyl alcohol

e) Formaldehyde f) Acetone

OR

Q12)a) Describe phenol manufacturing by toluene oxidation. **[10]**

b) Explain phthalic anhydrade production. **[6]**

Total No. of Questions : 12]

SEAT No. : ____

P1008

[Total No. of Pages : 3

[4163] - 89

T.E. (Chemical)

MASS TRANSFER - II

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) 100 moles of benzene (i) and toluene (ii) mixture containing 50% mole of benzene is subjected to a differential distillation at atmospheric pressure till the composition of the benzene in the residue is 33%. Calculate the total moles of the mixture distilled. Average relative volatility is 2.16. **[10]**

b) Explain Azeotropic distillation and extractive distillation. **[8]**

OR

Q2) a) 1000 kg moles/hr of an ethanol propanol mixture containing 65 moles percent ethanol is to be separated in a continuous plate column operating at 1 atmosphere total pressure. The desired terminal compositions in units of mole fraction of ethanol are

$x_D = 0.92$ and $x_W = 0.07$

The feed is a saturated vapour and total condencer is used. When the reflux flow rate is four times the amount of top product, find the number of theoretical plates required for the separation.

Relative volatility of ethanol - propanol system may be taken as = 2.10 **[14]**

b) Explain relative volatility. **[4]**

P.T.O.

Q3) Picric acid is to be extracted from a dilute solution containing 0.1 mol picric acid per liter of solution using benzene as a solvent. 80% of the original picric acid is to be recovered.

The equilibrium data for benzene - picric acid - water system at 298K are as follows

$C_s \times 10^2$	0.0932	0.225	1	2	5	10	18
$\frac{C_S}{C_A}$	2.23	1.45	1.705	0.505	0.32	0.24	0.187

Where, C_S and C_A are the equilibrium concentrations of picric acid in mol/lit in benzene and aqueous phase respectively. Determine the quantity of benzene required per 1 litre of aqueous solution for **[16]**

a) Single stage operation

b) Three stage cross current operation using equal quantities of fresh solvent in each stage.

OR

Q4) a) Give the classification of liquid-liquid extraction equipments. **[6]**

b) Write short note on effect of temperature and pressure on equilibrium diagram in liquid-liquid extraction. **[6]**

c) What are the advantages of rectangular co-ordinates over equilateral triangular co-ordinates. **[4]**

Q5) Experiments on decolourization of oil yielded the following equilibrium relationship

$$y = 0.5\, x^{0.5}$$

y = gm of colour removed / gm of adsorbent

x = colour in the oil, gm of colour/1000 gm of colour free oil

100 kg of oil containing 1 part of colour to 3 parts of oil is agitated with 25 kg of the adsorbent. Calculate the % of colour removed if

a) all 25 kg adsorbent is used in one step

b) 12.5 kg adsorbent is used initially, followed by another 12.5 kg of adsorbent. **[16]**

OR

Q6) a) Write principles of ion exchange process and rate of ion exchange. **[8]**

b) State and explain types of adsorption and explain industrial adsorbents.**[8]**

SECTION - II

Q7) a) Crushed oil seeds containing 55% oil by weight are to be extracted at the rate of 4000 kg/hr using 6000 kg/hr of hexane containing 5% oil by weight as the solvent. A countercurrent two stage extraction system is used. The oil seed retain 1 kg of solution per kg of oil free cake. Calculate the percent recovery of oil (based on the original feed) obtained under the above conditions. **[12]**

b) Discuss the method of operation of liquid - solid contacting in teaching.**[6]**

OR

Q8) a) Classify teaching equipments and explain one of them in brief. **[10]**

b) Write a material balance of single stage teaching system. **[8]**

Q9) a) A saturate solution of Mg SO_4 at 353K (80ºC) is cooled to 303 K (30ºC) in a crystallizer. During cooling 4% solution is lost by evaporation of water. Estimate the quanlity of the original saturated solution to be fed to the crystalizer per 1000 kg of Mg SO_4. $7H_2O$ crystals. **[12]**

b) Explain crystallization kinetics. **[4]**

OR

Q10)a) Write principle and working of vacuum crystallizer with neat sketch.**[10]**

b) Describe methods of super saturation. **[6]**

Q11)a) Explain reverse osmosis with neat sketch. **[6]**

b) Define nanofiltration and give industrial applications. **[6]**

c) State membrane material selection criteria. **[4]**

OR

Q12)a) Give advantages of membrane separation over conventional process.**[6]**

b) Explain electrodialysis with neat sketch. **[6]**

c) What are the various membrane modules? Define membrane fouling.**[4]**

Total No. of Questions : 12] **SEAT No. :**

P1009 **[Total No. of Pages : 2**

[4163] - 90

T.E. (Chemical)

INDUSTRIAL ORGANIZATION & MANAGEMENT

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from section - I and 3 questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define Management. Explain various functions of Management. **[10]**

b) Explain Management by objectives. **[6]**

OR

Q2) Distinguish between Partnership and Private Limited company. Explain in detail the formation of Public Limited Company. **[16]**

Q3) a) Explain Maslow's theory of Motivation. **[8]**

b) What is performance appraisal. Explain. **[8]**

OR

Q4) What is Manpower planning? Enlist the objectives and methods of Manpower Planning. **[16]**

Q5) a) State and explain the functions of stores management. **[9]**

b) What is Economic Order Quantity? (EOQ) How it is derived? Explain the assumptions and objectives of EOQ? **[9]**

P.T.O.

OR

Q6) Write short notes on the following: **[18]**

a) ABC Analysis.

b) LIFO system.

c) Vendor Development.

SECTION - II

Q7) a) State and explain the objectives and importance of advertising and sales promotion. **[8]**

b) Differentiate between Marketing and selling. **[8]**

OR

Q8) What is Market Research? Explain various methods of Market research. How it helps an enterprise to position its business in a competitive business environment? Explain. **[16]**

Q9) a) Explain the concept of TQM. **[8]**

b) What is a copyright? Distinguish between copyright and Patents. **[8]**

OR

Q10)a) What is anti-dumpling duties? How is it levied? Explain the impact of anti-dumpling in International Business. **[8]**

b) State and explain the functions of Export Promotion Council. How it facilitates International Trade? **[8]**

Q11)Write short notes on the following. **[18]**

a) FEMA. b) Type of Contracts.

c) MRTP Act.

OR

Q12)a) Explain the concept of workstudy and its objectives. **[8]**

b) Explain in details **[10]**

i) Flow process charts. ii) Therbligs.

Total No. of Questions : 12]

SEAT No. :

P1010

[Total No. of Pages : 3

[4163] - 94

T.E. (Petroleum)

PRINCIPLES OF CHEMICAL ENGINEERING - I

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume Suitable data, if necessary.***

SECTION - I

Q1) a) Discuss principle of operation of a heat pump with help of neat sketch. **[5]**

b) What is absorption refrigeration? How it differs from normal refrigeration cycle. **[6]**

c) Discuss Joule Thomson Expansion and its usefulness. **[5]**

OR

Q2) a) Discuss various laws of Thermodynamics with help of mathematical expression and their physical interpretations. **[10]**

b) With help of neat sketch discuss Carnot Cycle and write down equation of its efficiency. Highlight its usefulness as well. **[6]**

Q3) a) With help of neat diagram discuss the operation of Centrifugal pump. **[6]**

b) Write a short note on standard dimensions of a agitated vessel. Provide relevant diagrams. **[6]**

c) Discuss important characteristics of a centrifugal pump. **[6]**

OR

P.T.O.

Q4) a) Define following: **[6]**

Mach Number, Stagnation Property, Subsonic flow.

b) Discuss flow of compressible fluid moving through Converging - Diverging nozzle. **[6]**

c) With help of diagram explain various types of regime possible for multiphase flow through a pipe. **[6]**

Q5) a) Obtain mathematical expression for 1^{st} order reaction carried in a continuously stirred tank reactor. **[8]**

b) What is a Catalyst? Discuss its usefulness. **[4]**

c) Differentiate between molecularity and order of reaction. **[4]**

OR

Q6) a) Define: Flash point and Detonation. **[4]**

b) Obtain the expression for chemical equilibrium for the following reversible reaction: **[6]**

$$2NH_3 \leftrightarrow N_2 + 3H_2$$

c) With help of real life example explain the importance of knowledge of Combustion Engineering for Petroleum Field Engineers. **[6]**

SECTION - II

Q7) a) Define following: **[6]**

Critical Temperature, Critical Pressure and Triple Point.

b) What are modifications needed in ideal gas laws in order to make it more practical. Discuss all the modifications in details. In this context write down van der Waal's equation of state with proper discussion on all the symbols. **[8]**

c) Write down short note on Compressibility Factor. **[4]**

OR

Q8) a) The critical temperature and pressure of ethane are 305.43 K and 48.84 bar. Calculate molar volume of the gas at 500 K and 4.2 MPa using. **[8]**

i) Ideal Gas Law

ii) Van der Waals equation of state

iii) Truncated form of virial equation

The virial coefficients are $B = -1.89 \times 10^{-4}$ m^3 / mol and

$C = -1.7 \times 10^{-8}$ $(m^3 / mol)^2$

b) Write down three different equations of state for real gases. Explain all the symbols therein. Discuss their application domain. **[10]**

Q9) a) Discuss the Gibbs-Duhem equation and provide its expression in different forms. In this context highlight its major field of application. **[8]**

b) What is vapour liquid equilibrium? Explain its significances. Briefly discuss how VLE of a system can be determined experimentally. **[8]**

OR

Q10)a) Define following with proper thermodynamic basis: **[8]**

i) Chemical Potential

ii) Partial Molar Properties.

b) Define bubble point and dew point. Discuss the stepwise procedure to obtain bubble point of a multi-component mixture. **[8]**

Q11)a) $1m^3$ of gas hydrate sample analyzed to contain almost 456 m^3 of ethane gas at STP and $1m^3$ of water. From this information will it be possible to calculate the density of the sample of gas-hydrate. **[8]**

b) Gas Hydrates may be the major cause of Sunami even mysterious Bermuda Triangle - Elaborate and explain. **[8]**

OR

Q12)a) With help of neat diagram explain different structures possible for gas hydrates - discuss their stabilities as well. **[8]**

b) With help of phase diagram explain formation of Gas Hydrates in the pipelines. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1011

[Total No. of Pages : 4

[4163] - 99

T.E. (Petroleum)

PRINCIPLES OF CHEMICAL ENGINEERING - II

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Methanol (A) - water (B) solution containing 50 wt % methanol at 26.7 ºC to be continuously rectified at 1 atm at a rate of 5000 kg/h to provide a distillate containing 95% methanol and residue containing 1.0% methanol (by weight). The feed is preheated at 37.8 ºC. The distillate is totally condensed at bubble point. A reflux ratio of 1.5 times the minimum is to be used. Determine

a) quantity of products,

b) minimum reflux ratio,

c) minimum number of theoretical stages and

d) number of theoretical stages at the specified condition. **[18]**

x	0	0.1	0.3	0.4	0.6	0.8	0.9	1.0
y^*	0	0.4	0.67	0.73	0.84	0.92	0.95	1.0

OR

Q2) a) Differentiate between packed tower and tray towers. **[8]**

b) Draw the neat $x - y^*$ diagram in graph paper for a binary system having relative volatility value of 0.87. Comment on the separability of the mixture. **[6]**

c) Write down Fick's law and discuss its applicability in real life situation. **[4]**

P.T.O.

Q3) a) Differentiate between Physical adsorption and Chemisorption. **[8]**

b) What are novel separation processes? Name five such processes and discuss any one of them with help of neat diagram. **[8]**

OR

Q4) a) Derive Reynold's analogy correlating Heat, Mass and Momoentum Transfer. Discuss its importance. **[8]**

b) Write a short note on Gas Absorption Process. Mention important characteristics of the solvent to be utilized. **[8]**

Q5) a) How the routing of fluids to be done through heat exchangers. Explain with help of suitable examples. **[6]**

b) Write a short note on various types of compact heat exchangers. **[6]**

c) Discuss the need of baffles in shell and tube heat exchangers. **[4]**

OR

Q6) A speciality chemical M is to be cooled from 165ºC to 34ºC at a rate of 356 kg/hr in a countercurrent double pipe heat exchanger, with water as coolant flowing through inner tube side. Raw water is available at 30ºC and maximum temperature rise possible is of 10ºC. **[16]**

a) Obtain heat duty of the exchanger.

b) Calculate flow rate of raw water.

c) If overall heat transfer coefficient be 662.3 W / (m^2. K), obtain the length of the required exchanger.

Data:

Inner Tube: ID = 21mm, OD = 25.4 mm, k_{wall} = 74.5 W / (m. K)

Outer Pipe: ID = 41 mm, OD = 48mm

For Chemical S : C_p = 1.88 kJ / (kg. ºC), μ = 0.37 cP, = 860 kg/ m^3 and k = 0.154 W / (m. K)

For raw water: = 0.77 cP and k = 0.613 W / (m. K)

SECTION - II

Q7) a) "We should not waste water, instead should develop means and mechanism to reuse and recycle it" - Explain with help of suitable examples from domestic front as well as industrial front. **[8]**

b) Indicate the immediate and long term impacts of air pollution on human and animal life. Name the major pollutants causing air pollution and briefly discuss each of them. **[8]**

OR

Q8) a) Discuss and Explain : Ozone Layer Depletion, Green House Effect, Acid Rain, BOD Test. **[8]**

b) What is HAZOP study? With a suitable example explain the HAZOP study also highlight its necessity. **[8]**

Q9) a) What is plot plan? Discuss briefly how plot plant development for a new commercial venture is executed. **[6]**

b) With help of neat sketch discuss all the major sections of a typical Rig Layout. Highlight importance of the Rig. **[6]**

c) Write a short note on plant process engineer and his duty and responsibility. **[4]**

OR

Q10)a) Fair Chemical decided to set up its plant for Specialty Chemicals. Discuss all the important factors need to be considered to choose appropriate location of the plant. Comment on the points. **[8]**

b) Discuss in details the development of P & ID for a chemical process and role of various persons involved. In this context explain the need and usefulness of the developed P & ID. **[8]**

Q11)a) Name four methods to check the health of process piping. Discuss any one of them in details. **[6]**

b) Write down advantages of Cross Country piping over other methods of transport. **[6]**

c) Write a short note on Assembly and Erection of Equipments. **[6]**

OR

Q12)a) What is the need of insulation for process pipelines? Discuss briefly how these are executed in real plants. Name four different insulating materials. **[6]**

b) Define economic diameter of a pipe - Explain its significance. **[4]**

c) Describe construction and working of (any four): **[8]**

i) Needle Valve.

ii) Butterfly Valve.

iii) Gate Valve.

iv) Solenoid Valve.

v) Ball Valve.

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Total No. of Questions : 12]

SEAT No. :

P1012

[Total No. of Pages : 7

[4163] - 103

T.E. (Petrochemical)

DIFFUSION AND MASS TRANSFER

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

ρ

Q1) a) A binary gas mixture at a total pressure of 1.0 atm and 21ºC has a molar composition of 30% CO and 70% CO_2. The absolute velocities of CO and CO_2 are 6.0 m/s and 3 m/s, respectively, all in the direction of the z-axis.

i) Calculate the mass average velocity, v, and the molar average velocity, V, for the mixture.

ii) Determine the four fluxes: $j_{CO,Z,}$ $n_{CO,Z,}$ $J_{CO,Z,}$ $N_{CO,}$ **[8]**

b) Derive from fundamentals the expression for steady state diffusion of gas R through another Nondiffusing gas S. **[8]**

OR

Q2) The solute HCl (A) is diffusing through a thin film of water (B) 2.5mm thick at 283 K. The concentration of HCl at point 1 at one boundary of the film is 11.0 wt% HCl (density $\rho 1 = 1065.7$ kg/m^3), and at the other boundary of the film at point 2 it is 8.0 wt% HCl (density 2 = 1035.3 kg/m^3). The diffusion coefficient of HCl in water is 2.5×10^{-9} m^2/s. Assuming steady state and one boundary impermeable to water, calculate the flux of HCl. **[16]**

P.T.O.

Q3) A 0.20-m-long test tube was used to study the diffusion process in which liquid A diffuses into gas B. In one study the level of liquid A was initially 0.1m below the top of the tube. The temperature was 25ºC and the total pressure was maintained at 1 atm. The molar flux of component A at the top of the test tube was found to be 1.6×10^{-3} kgmol/m^2.h. Find the diffusion coefficient for A into gas B. Assume that gas B is insoluble in liquid A. The partial pressure of A at the surface of the liquid was 0.06 atm. **[18]**

OR

Q4) a) Water evaporating from a pond does so as if it were diffusing across an air film 0.12 cm thick. The diffusion coefficient of water in 20ºC air is about 0.25 cm^2/s. If the air out of the film is 50% saturated, how fast will the water level drop in one day? **[8]**

b) An absorption tower has been proposed to remove selectively two pollutants, hydrogen sulfide and sulfur dioxide, from an exhaust gas stream with molar composition 4.0% H_2S, 6.0% SO_2, and 90.0% air. The gas mixture is at 373 K and 1 atm. using an appropriate empirical correlation, calculate the diffusivity of:

i) Hydrogen sulfide in the gas mixture.

ii) Sulfur dioxide in the gas mixture.

Data: Molecular Volumes for hydrogen sulfide, sulfur dioxide and Air are 20.96 cm^3/gmmole, 41.1 cm^3/ gmmole and 20.1 cm^3/gmmole respectively. **[10]**

Q5) Diffusivity of vapor of volatile liquid in air can be conveniently determined by Winklemann's method in which liquid is contained in a narrow vertical tube maintained at constant temperature. Air stream is passed over the top of tube rapidly to measure the partial pressure of vapor remains approximately zero. On the assumption, vapor is transferred from surface of liquid to a stream by molecular diffusion. Calculate the diffusivity of CCl_4 vapor in air at 321 ºK and 1 atm. pressure from following experimental data. Derive the equation you have used in this problem.

Data:

Time from commencement of experiment (ks)	Liquid Level	
	(cm)	(mm)
0	0	0
1.6	0.25	0.025
11.1	1.29	0.129
27.4	2.32	0.232
80.2	4.39	0.439
117.2	5.47	0.547
168.6	6.70	0.670
199.7	7.38	0.738
289.3	9.03	0.903
383.1	10.48	1.048

Additional Data: Vapor pressure of CCl_4 at 321 K is 37.6 kN/m^2 and density of liquid is 1540 kg/m^3. The kilogram molecular volume is 22.4 m^3. **[16]**

OR

Q6) Write short Notes on: **[16]**

a) Classification of Mass Transfer Operations.

b) Molecular and Eddy Diffusion.

c) Theories of Mass Transfer.

d) Analogy between heat, mass and momentum transfer.

SECTION - II

Q7) Air flows through a cylindrical tube made of naphthalene at a velocity of 5 m/s. The diameter of the tube is 0.1 m and the temperature of the air is 20 ºC.

a) Using the correlation proposed by Linton and Sherwood given below, calculate the mass transfer coefficient for the transfer of naphthalene to air.

$Sh = 0.023\ Re^{0.83}\ Sc^{1/3}$

$Sh =$, $Re = \frac{\rho d v}{\mu}$, $Sc = \frac{\nu}{D_{AB}}$

b) Compare this result with the values obtained using the analogies of:

i) Reynolds

ii) Prandtl

iii) Von Kármán

iv) Chilton-Colburn $\frac{k_c d}{D_{AB}}$

Note that the friction factor for this system, C_f, can be estimated using the equation :

$$\frac{C_f}{2} = (2.236 \ln Re - 4.639)^{-2}$$

Data:

$\rho_{air} = 1.8 \times 10^{-5}$ kg/m.s

$_{air} = 1.2$ kg/m^3

$D_{AB} = 4.24 \times 10^{-6}$ m^2/s **[18]**

OR

Q8) In an experimental study of the absorption of NH_3 by water from an air-ammonia mixture in a wetted-wall tower, the value of overall gas mass transfer coefficient, K_G was found to be:

90.25×10^{-2} k mole $NH_3/[(hr)\ (m^2)\ (std.\ atm.)]$

The operating pressure and temperature of the tower were 2 std. atm and 288 K respectively. For dilute solutions of ammonia in water at 288 K, the equilibrium partial pressure is given by:

$P_{A.i} = 5(C_{A,i})$

Where,

$P_{A,i}$ = equilibrium partial pressure of ammonia, std. atm.

$C_{A,i}$ = concentration of ammonia in water, k mole NH_3/m^3 solution

At the top of the tower, the outlet gas contained ammonia 1% by volume and inlet liquid, which this contacted with pure water. Assuming 75% of the total resistance to mass transfer was contributed by the gas phase,

Calculate:

a) the gas film coefficient, K_g.

b) the liquid film coefficient, K_1. $\int \frac{\rho}{K'_c} \frac{dp}{D_{AB}}$

c) the overall liquid mass transfer coefficient, K_L.

d) the interfacial concentrations $P_{A,i}$ and C_A.

[18]

Q9) a) Discuss the constriction details and working principles of Wetted Wall towers. **[8]**

b) Calculate the value of Mass transfer coefficient and flux of mass transfer from a sphere of naphthalene to air at 40ºC and 1 atm flowing at velocity of 0.45 m/s. The diameter of sphere is 25.4 mm. The diffusivity of naphthalene in air at 45ºC is 6.92×10^{-6} m^2/s and vapor pressure of solid naphthalene is 0.55 mm of mercury.

Data: $= 1.9 \times 10^{-5}$ Pa.s, $= 1.11$ kg/m^3 You may use the following correlation : $Sh = 2 + 0.552\ Re^{0.53} + Sc^{0.33}$

Where, Sh = . **[8]**

OR

Q10)a) Compare tray towers versus packed towers. **[6]**

b) An air stream at 51.6 ºC and 2 atmospheres (abs.) flows through a duct at 1.524 m/s past samples of solid naphthalene. Naphthalene diffusivity at 0ºC and 101.32 kPa is 5.15×10^{-6} m^2/s.

Estimate mass transfer coefficient K'_C for flow past the following shapes:

i) Parallel to a flat plate 150 mm long:

ii) Alone sphere of 12.7 mm diameter.

Data: at 52.6 ºC and 2 atm (abs.)

$= 1.96 \times 10^{-5}$ kg/m.s

$= 1.087$ kg/m^3

$D_{AB} = 3.51 \times 10^{-6}$ m^2/sec. **[10]**

µ

Q11)The solubility of a specific molecule in a polymeric membrane has been measured. The experimental data were obtained by taking a piece of film 1.0 cm × 5.0 cm of thickness 0.0127 cm and exposing it at 30ºC to the pure vapour of this solute. The weight gain, measured in equilibrium, was 4.7×10^{-3} g. The solute has a molecular weight of 70.0 g/mol. At 30ºC, the vapour pressure of the solute is 76.0 mm Hg. The film weight, free of solute, is 0.0575g. The film density, free of solute, is 0.9 g/cm^3

a) Find the solubility coefficient of the solute in the film.

b) The permeability of this polymeric film to the solute is $P_M = 7.6 \times 10^{-5}$ cm^3 STP/ (cm^2.s.atm/cm) at 30ºC. Calculate D_{AB} at 30ºC.

c) The solute sits at the bottom of a glass tube at 30ºC. To retard evaporation, a polymeric membrane is placed on top of the tube. If the thickness of the polymer membrane is 0.0254 cm and the cross-sectional area is 0.2 cm^2, what is the time required for 10 mg of the solute to pass through the barrier? **[16]**

OR

Q12) Write Short Notes on **[16]**

a) Releigh's equation for Simple distillation.

b) Tray Efficiency.

c) Concept of Equilibrium.

Total No. of Questions : 8]

SEAT No. :

P1013

[Total No. of Pages : 2

[4163] - 104

T.E. (Petrochemical)

CHEMICAL ENGINEERING THERMODYNAMICS

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data whereever necessary.***
5) ***Use of steam tables and electronic calculator is allowed.***

SECTION - I

Q1) a) Discuss P-V-T relations in context of hydrocarbons. State their applications. **[8]**

b) Calculate the specific volume of and hence the volume occupied by 150 kg of methanol vapor at 250K and 12 bar using ideal gas law and the Van der Waals equation. Tc and Pc for methanol are 512.6 K and 81 bar respectively. Compare your answers and give comments. **[10]**

Q2) a) State first law of thermodynamics for closed and open systems. Explain the terms involved. **[6]**

b) Iron is treated with aqueous HCl at 250 K to give aqueous FeC_{12} and hydrogen gas. Calculate the work done when 350 kg of iron reacts with HCl in a **[10]**

i) closed vessel and ii) an open vessel.

Q3) Derive Maxwell relations. Comment on their importance. **[16]**

P.T.O.

Q4) Write notes:

a) Joule Thomson Effect. **[6]**

b) Carnot Cycle for Heat Pump. **[6]**

c) Irreversibility and reversibility in thermodynamics. **[4]**

SECTION - II

Q5) a) Derive relationship of fugacity of a real gas to its pressure and temperature. **[6]**

b) Estimate fugacity of gaseous propane at 12 atm and 300 K using the following data: **[12]**

P atm	1.7	3.4	6.8	10.2	11.7	13.6
V m^3/kg	0.3313	0.1609	0.0754	0.0468	0.0382	0.021

Q6) a) Define chemical potential. State its significance. **[4]**

b) State Gibbs Duhem equation in its different forms. Comment on their relevance. **[12]**

Q7) a) Give the statement of equilibrium law applicable to VLE between nonideal solution and nonideal vapor. Explain the terms involved. **[6]**

b) Sketch T-x-y diagrams for minimum and maximum boiling azeotropes. **[4]**

c) Discuss Margulle's and Van Laar models of activity coefficients of solutions. **[6]**

Q8) a) What is the criterion for chemical equilibrium? State how equilibrium conversion can be calculated from the basic thermochemical data. **[6]**

b) Equilibrium constant for the ammonia formation reaction $N_2 + 3\ H_2 \text{ ---} \rightarrow 2\ NH_3$ is given as 0.00015 at 665.K. For stoichiometric feed and 15 bar pressure, calculate maximum conversion of N_2 and composition of equilibrium mixture on mol% basis. Report the partial pressures at equilibrium. **[10]**

Total No. of Questions : 12]

SEAT No. :

P1014

[Total No. of Pages : 4

[4163] - 107

T.E. (Petrochemical)

MASS TRANSFER OPERATIONS

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Attempt the following: **[18]**

a) Write a brief note on: Choice of Solvent for Gas Absorption.

b) Write a brief note on: Optimum reflux ratio for distillation.

c) Discuss in brief the principles and application of Crystallization.

d) Discuss the five possible feed conditions in distillation operations.

OR

Q2) A distillation column is separating mixture of water (MVC) and acetic acid input to the column at two locations. Both feeds are 1000 kmol/hr but one contains 65% water and the other 50%. The top and bottom products are saturated liquids containing 98-mol% and 5 - mol% water. Determine the optimal feed stage for each feed and the number of stages required, if the column is operated at a reflux ratio 20% larger than the minimum reflux ratio. The vapour liquid equilibrium data is given below. **[18]**

Data:

x	0.005	0.05	0.13	0.21	0.30	0.51	0.65	0.80	0.96
y	0.011	0.13	0.24	0.34	0.44	0.63	0.75	0.87	0.97

P.T.O.

Q3) 1000 kg/hr of a mixture containing 42 mole percent heptane and 58 mole percent ethyl benzene is to be fractionated to a distillate containing 97 mole percent heptane and a residue containing 99 mole percent ethyl benzene using a total condenser and feed at its saturated liquid condition. The enthalpy-concentration data for the heptane-ethyl benzene at 1 atm pressure are as follows: **[16]**

$x_{heptane}$	0	0.08	0.18	0.25	0.49	0.65	0.79	0.91	1.0
$y_{heptane}$	0	0.28	0.43	0.51	0.73	0.83	0.90	0.96	1.0
H_1 (kJ/kmol) × 10^{-3}	24.3	24.1	23.2	22.8	22.05	21.75	21.7	21.6	21.4
H_v (kJ/kmol) × 10^{-3}	61.2	59.6	58.5	58.1	56.5	55.2	54.4	53.8	53.3

Calculate the following:

a) Minimum reflux ratio
b) Minimum number of stages at total reflux
c) Number of stages at reflux ratio of 2.5
d) Condenser duty
e) Reboiler duty.

OR

Q4) An Equimolar mixture of benzene and toluene is subjected to flash distillation at a pressure of 1 bar in the separator. Determine the compositions (in mole fraction benzene) of the liquid and Vapour leaving the separator when the feed is 25% vaporized. Estimate the temperature in the separator.

Equilibrium data for benzene-toluene system at 1 bar is given in table given below. **[16]**

Temperature (°C)	Mole fraction benzene in liquid	Mole fraction benzene in Vapour
80.1		1.000
85.0	0.780	0.900
90.0	0.581	0.777
95.0	0.411	0.632
100.0	0.258	0.456
105.0	0.130	0.261
110.6	0.000	0.000

What are the concentrations in the Vapour and liquid, and the separator temperature the feed is:

a) 0% vaporized
b) 50% vaporized
c) 75% vaporized
d) 100% vaporized

Plot the operating lines for each of these cases and discuss how the operating lines change as f changes.

Q5) a) Derive the expression $y = \frac{\alpha x}{[1+(\alpha-1).x]}$. **[6]**

b) Draw a equilibrium diagram and boiling point diagram for an azeotropic binary system. **[6]**

c) Derive Fenske equation. State the important assumptions in this derivation. **[4]**

OR

Q6) Write short notes on: **[16]**

a) Vacuum and Steam Distillation.

b) Azeotropic and Extractive distillation.

c) Shortcut design method for distillation column design.

SECTION - II

Q7) 80 tons per day of oil sand (25 mass % oil and 75 mass % sand) is to be extracted with 40 tons per day of naphtha in a continuous counter current extraction battery. The final extract from the battery is to contain 40 mass% oil and 60% mass naphtha, and the underflow from each unit is expected to consist of 35 mass% solution and 60 mass% sand. If the overall efficiency of the battery is 50%. How many stages will be required? **[18]**

OR

Q8) It is required to extract picric acid from a dilute aqueous solution containing 0.15 mole picric acid per liter of solution using benzene as solvent with a recovery of 80% of the picric acid originally present. Determine the quantity of benzene required per liter of aqueous solution by employing

a) single-stage extraction and

b) three - stage extraction (crosscurrent) using equal amounts of fresh solvent in each stage. The equilibrium data for benzene-picric acid-water system at 25ºC is given by:

Data:

$C_B \times 10^2$	0.093	0.225	1	2	5	10	18
$m = \frac{C_B}{C_A}$	2.23	1.45	1.705	0.505	0.32	0.24	0.187

Where , C_B and C_A are the equilibrium concentrations of picric acid in benzene and aqueous phases respectively in mole/liter. **[18]**

Q9) a) Classify the commercial extraction equipments. State working principles any one of them. **[12]**

b) Write a note on : Ternary Diagram. **[4]**

OR

Q10) Give the classifications of crystallizer. Explain the working principles and construction of any one type of crystallizer with neat sketch. **[16]**

Q11) a) Discuss in brief Process principles involved in PSA and TSA. **[10]**

b) Discuss in brief various adsorption isotherms. **[6]**

OR

Q12) Write Short notes on: **[16]**

a) Classification of Membrane separation processes.

b) Reverse Osmosis: Principles and application.

c) Pervaporation: Principles and applications.

Total No. of Questions : 6] **SEAT No. :**

P1015 **[Total No. of Pages : 2**

[4163] - 112

T.E. (Polymer Engineering)

POLYMER CHEMISTRY - I

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define and explain **[9]**
i) Functionality ii) Oligomers.

b) Explain IUPAC systems for the nomenclature of polymers in detail giving suitable examples. **[8]**

OR

a) Explain the following classifications of polymers with suitable examples. **[9]**
i) Addition and condensation.
ii) Based on functional groups

b) Explain why polymers are not unidispersed systems? **[8]**

Q2) a) Explain end group analysis technique for MW determination. **[9]**

b) Explain with suitable examples how will you calculate Mn for polymers? **[8]**

OR

a) Explain membrane osmometry in detail. **[9]**

b) Write a note on practical significance of molecular weight. **[8]**

Q3) a) Draw and interpret the curve for hypothetical polydispersed system and a curve for polymer samples with same Mn but different polydispersity. **[8]**

b) Explain separation of polymer by fractional precipitation methods. **[8]**

OR

a) Explain MW determination technique that also gives MWD. **[8]**

b) Explain the concept of polydispersity. Mention its advantages and drawbacks. **[8]**

P.T.O.

SECTION - II

Q4) a) Discuss gas phase polymerization. **[9]**

b) Discuss interfacial polymerization. **[8]**

OR

a) Discuss plasma polymerization. **[9]**

b) Discuss interfacial polymerization. **[8]**

Q5) Explain initiation, propagation, termination and chain transfer reactions in :

a) Free radical polymerization. **[9]**

b) Cationic polymerization. **[8]**

OR

a) Explain in detail the anionic polymerization technique. **[9]**

b) Write a note on group transfer polymerization. **[8]**

Q6) a) Explain mechanism of ROP for any one monomer. **[8]**

b) Write a note on gelation and crosslinking. **[8]**

OR

a) What is stoichiometry? Explain the need for stoichiometric control. What is stoichiometric imbalance? **[8]**

b) Write a note on polyaddition polymerization. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P1016

[Total No. of Pages : 3

[4163] - 114

T.E. (Polymer Engineering)

CHEMICAL ENGINEERING OPERATIONS

(2003 Pattern) (Sem. I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Numbers to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic table, electronic pocket calculators is allowed.***

SECTION - I

Q1) a) Carbon monoxide gas is flowing through membrane of polymer, which is 1.2mm thick. The partial Pressure of gas is 100 mm of Hg on one side and negligible on other side under STP conditions.

Solubility coefficient is 0.82 cm^3gas STP/cm^3 atm.

The diffusivity is $1.1*10^{-10}$ m^2/sec.

Calculate permeability and rate of diffusion. **[8]**

b) Write a note on: **[10]**

i) Diffusion through crystalline solids.

ii) Mass, Heat and Momentum transfer analogies.

OR

Q2) a) By what percentage would the rate of absorption be increased or decreased by increasing the total pressure from 100 to 200 kN/m^2 in the following case. The absorption of ammonia and air containing 10% ammonia by volume. Using pure water as solvent, assume all the resistance to mass transfer lies within the gaseous phase. Assume the diffusivity is inversely proportional to the pressure. **[10]**

b) Write a note on Classification of Mass transfer Operations. **[8]**

P.T.O.

Q3) a) Describe in detail any one equipment with necessary diagram used for providing intimate contact of gas-liquid operation. **[10]**

b) Write a note on "Choice of Solvent" for gas Absorption. **[6]**

OR

Q4) a) Explain the terms Relative Volatility and Reflux ratio with their importance. **[8]**

b) Create y-x diagram by using relative volatility term for Methanol - Water system. **[8]**

Component	Boiling Point (ºC)	Vapor Pressure at 65.5ºC (kPa)	Vapor pressure at 100ºC (kPa)
Methanol	65.5	104.54	351.76
Water	100	25.43	100.85

Q5) a) Explain the terms such as Free Moisture, Equilibrium Moisture, and Drying time. **[8]**

b) Explain in detail Reverse Osmosis Technique. **[8]**

OR

Q6) a) Discuss with applicable terminologies the properties of water vapor air mixture. **[8]**

b) Write a short note on: **[8]**

i) Diffusion through Porous solid.

ii) Adiabatic Saturation Temperature.

SECTION - II

Q7) a) Discuss the Danckwarts concept of Scale of Segregation and Intensity of Segregation. **[9]**

b) Explain the concept "Scale of Scrutiny and Scale of Examination" for describing State of Admixture. **[9]**

OR

Q8) a) A feed mixture containing 14% moisture was mixed in a mixer with 10 wt% of a tracer. After 3 min of mixing 12 random samples were taken from the mixture and analyzed for the tracer material. The measured concentration in the samples were, in wt% of tracer as below **[16]**

10.24	9.30	7.94	10.24	11.08	10.03
11.91	9.72	9.20	10.76	10.97	10.55

Calculate the mixing Index and the standard deviation.

b) Define Striation Thickness. **[2]**

Q9) a) Write a note on Cross-Mixing devices used in the design of Two Roll Mill in respect of Improving cross-mixing action. **[12]**

b) What rotation speed, in rpm, would you recommend for a tumbler 1200 mm in diameter charged with 5mm feed size. **[4]**

OR

Q10)a) Discuss in detail the Mixing mechanism with the help of construction, working, Methods of Improving cross-mixing action and applications of tumble Blenders. **[10]**

b) Discuss in detail construction, mixing action of Intensive Non Fluxing Mixer. **[6]**

Q11)a) Write a short note on constructional features and mixing action in Ko-Kneaders. **[6]**

b) Discuss in detail different additives to be used in PVC compounding with any one PVC formulation. **[10]**

OR

Q12)a) Sketch and explain flow diagram for Rubber compounding. **[8]**

b) Sketch and explain flow diagram for calendaring plant for poly vinyl chloride. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1017

[Total No. of Pages : 2

[4163]-118

T.E. (Polymer Engineering)

INSTRUMENTATION AND PROCESS CONTROL

(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic table, electronic pocket calculators is allowed.***

SECTION - I

Q1) a) A pressure gauge instrument is specified as having range of 100-500 bar and an accuracy of +/- 0.5 bar and sensitivity of 0.3 divisions/bar and resolution of 0.1% full scale deflection. Find range, sensitivity, and accuracy. **[6]**

b) Discuss any four terms used to describe the static characteristics of any instrument. **[10]**

OR

Q2) a) Discuss any four terms used to describe the dynamic characteristics of any instrument. **[10]**

b) Explain the different parts of measuring instruments illustrate with suitable examples. **[6]**

Q3) a) Explain different laws on which thermoelectric temperature measurements depend. Explain the use of Thermocouple Table. **[10]**

b) Discuss in brief classification of the methods of temperature measurement. **[8]**

OR

Q4) a) List out the different units of pressure and explain any pressure measuring device in detail based on principle, working, construction, advantages and disadvantages. **[10]**

b) Explain with neat diagram, principle, construction, working, merits and demerits of Radiation Pyrometers. **[8]**

P.T.O.

Q5) a) With a neat sketch explain construction, working, advantages and disadvantages of venturi meter. **[10]**

b) Explain the importance of density measurement in polymer industry and suggest suitable instruments for doing so. **[6]**

OR

Q6) a) A sharp edge orifice meter connected to manometer is installed in pipe of ID 15cm through which liquid with density 1500 kg/m^3 is flowing and if volumetric flow rate = 800 m^3/hr and manometer reads 450 mm find size of orifice meter Cd = 0.61. **[10]**

b) Explain the importance of viscosity measurement in polymer industry and suggest suitable instruments for doing so. **[6]**

SECTION - II

Q7) a) Explain the term Process control with its benefits. **[10]**

b) Describe the response of First Order System for step Input Forcing Function. **[8]**

OR

Q8) a) Explain the terms: Transfer Function, Block Diagram. **[8]**

b) Write a note on the response of Non-interacting system. **[10]**

Q9) a) Discuss with neat diagram the behaviour of feedback control system using different kinds of control action when it is subjected to disturbance. **[8]**

b) Discuss the components of feedback control system with suitable examples. **[8]**

OR

Q10) a) Explain the terms used to describe an under damped second order response. **[8]**

b) Write a note on Servo and Regulator problem control system. **[8]**

Q11) a) Discuss any two examples of PC based control system. **[10]**

b) Discuss the Single input single output (SISO) and multiple input multiple output (MIMO) feedback control system. **[6]**

OR

Q12) a) Discuss the importance of advanced process control. **[6]**

b) Write a note on Ratio Control, Cascade Control. **[10]**

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Total No. of Questions : 12]

SEAT No. :

P1018

[Total No. of Pages : 3

[4163]-119

T.E. (Polymer)

POLYMER THERMODYNAMICS AND REACTION ENGINEERING

(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to Section-I and Section-II should be written on separate answer book.***
2) ***Solve 3 questions from Section-I and 3 questions from Section-II.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Derive Maxwell's equation and also state its importance. **[8]**

b) Explain various equation of state and their significances. Explain its usefulness in preparing compressibility charts. **[8]**

c) Give the statement of Second Law of Thermodynamics? **[2]**

OR

Q2) a) State the First Law of Thermodynamics and derive its mathematical equation for flow process. **[8]**

b) Define the term Enthalpy. Explain its correlation with internal energy and heat at constant volume and pressure. **[6]**

c) What do you understand by Internal Energy and Entropy? **[4]**

Q3) a) Explain Fugacity Model and evaluation of fugacity using free volume equation of state and compressibility or *z* factor. **[8]**

b) Explain in detail (statement alongwith equation formulation) the First Law of Thermodynamics for closed system. **[8]**

OR

P.T.O.

Q4) a) State Raoult's Law. **[2]**

b) Write a short note on Chemical Potential and Bubble point and Dew point. **[8]**

c) Derive Gibbs-Helmhottz equation. **[6]**

Q5) a) Explain in detail Flory-Huggins theory for polymer solvent system. **[8]**

b) Write a short note on LCST and UCST, and Athermal Solution. **[8]**

OR

Q6) a) State and explain the significance of solubility parameter in polymer mixing. **[6]**

b) What are Entropy and Heat of Mixing? Explain their importance w.r.t. polymer mixing. **[6]**

c) Write a short note on Dilute Solution. **[4]**

SECTION - II

Q7) a) Explain in detail differential and integral methods used for batch reactor data interpretation. **[7]**

b) What is zero order reaction? Derive the expression for rate constant of irreversible zero order reaction. Also, show that the half life period of zero order reaction is directly proportional to initial concentration of reactant. **[7]**

c) Write a short note on Rate of Reaction. **[4]**

OR

Q8) a) Explain in detail Elementary and Non-Elementary Reactions. **[5]**

b) Show that for first order reaction time required for 75% conversion is double the time required for 50% conversion. **[7]**

c) Decomposition of gas is second order when initial concentration of gas is 5×10^{-4} mol/l, it is 40% decomposed in 50 min. Calculate the rate constant for this system. **[6]**

Q9) a) Classify the chemical reactor in detail. **[9]**

b) Compare between plug flow and constant stirred tank reactors. **[5]**

c) What do you understand by Ideal PFR? **[2]**

OR

Q10) a) Derive the performance equation for plug flow reactor. **[10]**

b) Explain the following terms - Expansion, Space time, Holding Time. **[6]**

Q11) a) What is Chemical Equilibrium? Explain the criteria of chemical equilibrium. **[8]**

b) Derive expression for equilibrium constant and standard free energy change. **[8]**

OR

Q12) a) With neat sketch explain the effect of pressure and temperature on equilibrium constant. **[8]**

b) What are the various methods to determine equilibrium constant? Explain any one in detail. **[8]**

✷ ✷ ✷

Total No. of Questions : 12]

P1028

SEAT No.:

[Total No. of Pages : 3

[4163]-131
T.E. (IT)
OPERATING SYSTEMS
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions for each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the services provided by Operating System. **[8]**

b) Explain the following types of system : **[8]**

i) Multiprogrammed System.
ii) Multiprocessor System.
iii) Real Time System.
iv) Time Shared System.

OR

Q2) a) Draw and explain the architecture of windows 2000. **[8]**

b) Describe with the help of neat diagram the interaction of Operating System with the Hardware Architecture. **[8]**

Q3) a) Explain with Pseudo-Code implementation of dining philosopher problem using semaphore. **[8]**

b) Explain the concept of context switching with the help of neat diagram. **[4]**

c) Draw and explain process state transition diagram. **[6]**

OR

P.T.O.

Q4) a) Consider the following snapshot of the system at time T_0. **[12]**

Processes	Allocation			Max			Available		
P1	0	1	0	7	5	3	2	3	0
P2	3	0	2	3	2	2			
P3	3	0	2	9	0	2			
P4	2	1	1	2	2	2			
P5	0	0	2	4	3	3			

i) Determine Need matrix.
ii) Determine safe sequence.
iii) Check whether following request can be granted.
Request P5 $\rightarrow$ (0 1 0) and Request P1 $\rightarrow$ (2 0 0).

b) What is deadlock? Explain how wait-for graph is obtained. **[6]**

Q5) a) What are the characteristics of Real Time Scheduling? Explain. **[6]**

b) Explain Preemptive and Non-Preemptive CPU scheduling. **[4]**

c) State and explain CPU scheduling criteria for uniprocessor scheduling. **[6]**

OR

Q6) a) Explain the term granularity in multiprocessor scheduling. Briefly describe 5 different categories of synchronization granularity. **[6]**

b) Consider following set of processes with given arrival time, burst time, and priority. **[10]**

Processes	Arrival Time	Burst Time	Priority
P1	0	3	3
P2	1	5	1
P3	3	2	3
P4	9	5	2
P5	12	5	1

Draw the Gantt chart and find average turnaround time and average waiting time for following CPU scheduling algorithms.

i) Round robin (Quantum = 2)
ii) Shortest job first - preemptive.
iii) Priority - Preemptive.

SECTION - II

Q7) a) For the given reference string determine the number of page faults for

i) FIFO.

ii) OPTIMAL.

iii) LRU page replacement algorithm.

4 5 6 7 4 5 8 4 5 6 7 8 6 4 7 5.

Assume number of frames available are three. **[12]**

b) Explain translation look-aside buffer with the help of neat diagram. **[6]**

OR

Q8) a) Explain the concept of memory partitioning. Describe fixed partitioning in detail. **[10]**

b) Explain following memory allocation strategies in detail with the help of neat diagram. Best Fit, Next Fit. **[8]**

Q9) a) Write short note on I/O buffering. **[8]**

b) Explain free space management with examples. **[8]**

OR

Q10) a) Explain any four types of file organization techniques. **[8]**

b) With the help of neat diagram explain record blocking. **[8]**

Q11) a) Explain following built in variables in AWK. **[8]**

NR, NF, FS, OFS, FILENAME, ARGC, ARGV

b) Write short note on : **[8]**

i) Trojan Horse.

ii) Virus.

OR

Q12) a) State different methods of user authentication. **[8]**

b) Explain UNIX password scheme with the help of neat diagram. **[8]**

Total No. of Questions : 12]

SEAT No.:

P1029

[Total No. of Pages : 2

[4163]-132
T.E. (Information Technology)
MULTIMEDIA SYSTEMS
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain different building blocks of Multimedia. **[10]**

b) Compare DDA and Bresenham line drawing algorithm. **[8]**

OR

Q2) a) With the help of example explain Scan line seed fill algorithm. **[8]**

b) What is aliasing? Explain methods of anti aliasing. **[10]**

Q3) a) Explain seed fill algorithm for filling a polygon. **[6]**

b) Show with appropriate figures the following reflections of a 2D object. **[10]**

i) About x axis.
ii) About y axis.
iii) About origin.
iv) About a line y = x.

OR

Q4) a) What is homogeneous co-ordinate system? What do you mean by composite co-ordinate system? **[8]**

b) Vector scan versus raster scan display. **[8]**

Q5) Write short notes on : **[16]**

P.T.O.

a) Cohen Sutherland algorithm.

b) Flood fill.

c) Phong Shading.

OR

Q6) a) What is shading? Explain Gourd shading algorithm for polygon shading. **[8]**

b) Explain inside and outside test for polygon clipping. **[8]**

SECTION - II

Q7) a) Explain the characteristics of sound. **[8]**

b) Describe concept of animation with four principle methods. **[8]**

OR

Q8) a) Explain NTSC and PAL video standard. **[8]**

b) Describe MIDI file format and its commands. **[8]**

Q9) a) Explain in detail SECAM video standards with its all features. **[6]**

b) Explain RGB, YUV, and CMY color models. **[10]**

OR

Q10) a) Explain different compression techniques in audio. **[8]**

b) Explain the digitization process of sound. **[8]**

Q11) a) Describe the types of data compression. **[4]**

b) State the steps of JPEG compression. **[6]**

c) Describe MPEG compression technique. **[8]**

OR

Q12) Write short notes on : **[18]**

a) Segmentation in Animation.

b) LZW - compression algorithm.

c) Quantization used in JPEG.

Total No. of Questions : 12]

SEAT No. :

P1031

[Total No. of Pages : 4

[4163] - 134
T.E. (Information Technology)
THEORY OF COMPUTATION
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer Q.No. 1 or Q.No.2, Q.No. 3 or Q.No. 4 and Q.No. 5 or Q.No. 6 from Section - I and Q.No. 7 or Q.No.8, Q.No. 9 or Q.No. 10 and Q.No. 11 or Q.No. 12 from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Construct an equivalent DFA for the following: **[6]**

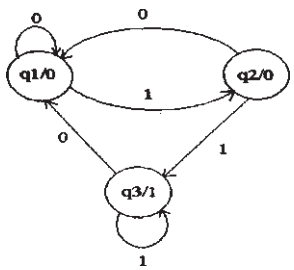
States/ Σ	0	1
$\rightarrow$ p	{p, q}	{q}
(q)	{r}	{r}
r	-	{r}

b) Construct DFA which accepts string consisting of strings of a's and b's which does not contain substring 110. **[8]**

c) What is NFA and DFA? **[4]**

OR

Q2) a) Convert the following Moore machine into Mealy machine. **[6]**



b) Construct Mealy machine to construct 2's complement for given binary number. **[6]**

P.T.O

c) Compare following: **[6]**

i) DFA and NFA.

ii) Moore machine and Mealy Machine.

Q3) a) Show that: **[6]**

i) (rs+r)*r = r (sr+r)*

ii) s(rs + s)*r = rr*s(rr*s)*.

b) State and prove Arden's theorem. **[4]**

c) Find Regular Expression from following FA. **[6]**

States/ Σ	0	1
$\rightarrow$ q1	q0	q2
(q2)	q3	q2
q3	q3	q3

OR

Q4) a) Write Regular Expression for following sentences: **[6]**

i) A set of all strings of 0's and 1's ending in 10.

ii) A set of all strings having odd number of 1's.

iii) A set of all strings of 0's and 1's whose last two symbols are same.

b) Check whether P and Q are equal or not : P = (0 + 11)* (1 + 00)*, Q = (0+1)*. **[4]**

c) Using pumping lemma check whether following sets are regular or non-regular **[6]**

i) $L=\{a^{n^2} \mid n>=1\}$.

ii) $L=\{a^n b^m \mid m,n>=1, m>n\}$.

Q5) a) Derive the string "aabbaa" for leftmost derivation and rightmost derivation and also construct parse tree of following CFG: **[8]**

$S \rightarrow aSX \mid b$

$X \rightarrow Xb \mid a$.

b) Find CNF for the given CFG: **[4]**

$S \rightarrow aAS|a$

$A \rightarrow SbA|SS|ba$.

c) Convert the following Right linear grammar to Left linear grammar. **[4]**

$S \rightarrow 0A$

$A \rightarrow 1A|\varepsilon$.

OR

Q6) a) Explain Chomsky hierarchy or grammar. Explain CNF. **[6]**

b) Eliminate the useless symbols for the following grammar: **[10]**

$S \rightarrow aS|A|C$

$A \rightarrow a$

$B \rightarrow aa$

$C \rightarrow aCb$.

SECTION - II

Q7) a) Obtain a PDA to accept the language $L=\{a^n b^n | n \geq 1\}$ by a final state. **[8]**

b) Show that CFLs are closed under Union, Concatenation and Kleene closure. **[8]**

OR

Q8) a) Obtain a PDA to accept the language **[8]**

$L=\{w|w \in \{a,b\}^* \text{ and } n_a(w) > n_b(w)\}$.

b) What do you mean by equivalence of PDA and CFG? Explain. **[4]**

c) Define a PDA. **[4]**

Q9) a) Obtain a Turing Machine to accept a language $L=\{0^n 1^n | n \geq 1\}$. **[8]**

b) Write short notes on: **[8]**

i) Halting problem of Turing Machine.

ii) Universal Turing Machine.

OR

Q10) a) Obtain a Turing Machine to accept the language containing strings of 0's and 1's ending with 011. **[8]**

b) Design a Turing Machine to compute 1's complement. **[8]**

Q11) Write short notes on: **[18]**

a) Church's Hypothesis.

b) Applications and limitations of FA.

c) Post Correspondence Problem.

OR

Q12) Write short notes on: **[18]**

a) Applications and limitations of PDA.

b) Different properties of recursive and recursively enumerable languages.

c) Growth rate of functions.

Total No. of Questions : 12]

SEAT No. :

P1032

[Total No. of Pages : 3

[4163] - 135
T.E. (Information Technology)
SYSTEM SOFTWARE
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer Q.No. 1 or Q.No.2, Q.No. 3 or Q.No. 4 and Q.No. 5 or Q.No. 6 from Section - I and Q.No. 7 or Q.No.8, Q.No. 9 or Q.No. 10 and Q.No. 11 or Q.No. 12 from Section - II.***
2) ***Answers to the two sections should be written separately.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if required.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe various activities under Language Processing. **[8]**

b) Define following Terms and give examples wherever applicable. **[8]**

i) Language Processing Pass.

ii) Language Processor.

iii) Preprocessor.

iv) Cross Assembler.

OR

Q2) a) Write short notes on: **[8]**

i) Lex & YACC.

ii) Debug Monitors.

b) Give the importance of User Interface in Software. Application and give structure of User Interface. **[8]**

Q3) a) Give the flow chart for handling nested macro calls. **[10]**

b) What types of errors are handled by the assembler? Explicitly mention error reporting in Pass I and Pass II of two pass assembler. **[8]**

OR

P.T.O

Q4) For the following code generate macro name table, macro definition table, and expanded code. **[18]**

```
            MACRO
            CALC & X, & Y, & OP = MULT, &LAB =
&LAB        MOVER AREG, & X
            & OP AREG, & Y
            MOVEM AREG, &X
            MEND
            MACRO
            CLEAR &X, &N
            LCL &M
&M          SET       0
            MOVER AREG, = '0'
.MORE       MOVER AREG, &X + &M
&M          SET       &M+1
            AIF (&M NE & N). MORE
            MEND
            START
            MOVER AREG, B
            CALC P, Q, LAB = LOOP:
            CLEAR A, 3
            MOVEM A, N
A           DS  5
B           DS  1
C           DS  1
N           DS  1
P           DS  1
Q           DS  1
            END
```

Q5) a) Explain with example the input and output of lexical analysis phase of compiler. Mention the data structures required. **[8]**

b) Consider the assignment statement in C given below. **[8]**

```
a = a * 3.14/180;
```

Explain the processing of above statement in all 6 phases of Compiler.

OR

Q6) a) Explain with example how recursive descent parser works. **[8]**

b) Explain with an example the concept of ambiguous grammar. **[4]**

c) Write a short note on "Bootstrap Compiler". **[4]**

SECTION - II

Q7) a) What are the different ways of representing Intermediate Code in Compiler? Give examples of each. **[8]**

b) Discuss code generation Issues. **[8]**

OR

Q8) a) Explain machine dependent code optimization techniques with examples. **[8]**

b) What are different types of storage allocation strategies - Compare them. **[8]**

Q9) a) What are the four basic tasks of the loader? **[4]**

b) Explain the absolute loader scheme with an example. And also explain how these tasks are performed by this loader. **[8]**

c) Discuss design of absolute loader with the help of flowchart. **[6]**

OR

Q10) a) Explain BSS loading scheme with the help of an example. Explain how four basic functions of loader are performed in BSS loading scheme. **[12]**

b) Write short notes on: **[6]**

i) Dynamic Loading.

ii) Dynamic Linking.

iii) Overlays.

Q11) a) Explain in brief how an OLE functions. **[8]**

b) Explain the term Dynamic Data exchange. **[8]**

OR

Q12) a) Explain the use of Clip Board in windows programming. **[8]**

b) Explain Dynamic Linking with and without import. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1037

[Total No. of Pages : 2

[4163] - 142
T.E. (Biotechnology)
BIOSEPARATIONS
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the need for cell disruption and methods of cell disruption in detail. **[16]**

OR

Q2) Write short notes on: **[4 × 4 = 16]**

a) Ultrasonication.

b) Osmosis.

c) Extraction.

d) Enzymatic cell disruption.

Q3) What is chromatography? Explain in detail the classification of chromatography? Elaborate on each type in brief. **[16]**

OR

Q4) What is ion exchange chromatography? What are different types of ion exchange chromatography? Explain in detail with its applications. **[16]**

Q5) Explain in detail dead – end and cross flow filtration. Explain preparation methods of membrane filtration. **[18]**

OR

Q6) Write short notes on: **[3 × 6 =18]**

a) Precipitation.

b) Sedimentation.

c) Flocculation.

P.T.O

SECTION - II

Q7) Discuss the role of bioseparation techniques in Bioprocess engineering. **[16]**

OR

Q8) Enlist various primary and secondary metabolites compounds. Write a note on recombinant protein expression. **[16]**

Q9) a) Discuss in detail various drying techniques.

b) Discuss in detail various methods of liquid-liquid extraction.

[16]

OR

Q10) Write short notes on: **[2 × 8 =16]**

a) Lyophilzation.

b) Leaching.

Q11) Discuss the method of production of therapeutic monoclonal antibodies with the detailed flow sheet. **[18]**

OR

Q12) Write short notes on: **[2 × 9 = 18]**

Bioseparation techniques used for purification of following products:

a) Organic Acid.

b) Enzymes.

Total No. of Questions : 6]

SEAT No. :

P1038

[Total No. of Pages : 2

[4163] - 143
T.E. (Biotechnology)
INDUSTRIAL MICROBIOLOGY
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer 3 questions from each section.*
2) *Answers to the two sections should be writtten in separate answer books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Maximum marks for each question is given in parenthesis.*

SECTION - I

Q1) Explain how fermentation medium is different from synthetic medium. **[18]**

OR

Explain the screening process for the antibiotic producing microorganisms with reference to Penicillin production.

Q2) Write short notes:

a) Black strap molasses. **[8]**

b) Citric acid production. **[8]**

OR

Differentiate between Glycerol fermentation and ethanol fermentation. **[16]**

Q3) Describe in details the lactic acid production. **[16]**

SECTION - II

Q4) Describe the process for manufacturing Penicillin. **[18]**

OR

Describe the commercial production of Lysine and explain its applications.

P.T.O.

Q5) Define immobilized enzymes and describe various techniques for its production. **[16]**

OR

Explain the creteria used while making a product economically viable.

Q6) Describe in brief:

a) Microbes in metal recovery. **[8]**

b) Single cell protein. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1039

[Total No. of Pages : 3

[4163] - 144

T.E. (Biotechnology) (Common to Chemical)

MASS TRANSFER - I

(Sem. - I) (2003 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I & any three questions from Section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Use of Programmable calculator is not allowed.***
4) ***Draw a neat sketch wherever necessary.***
5) ***Make necessary assumptions wherever required.***

SECTION - I

Q1) Classify different mass transfer operations and give example of each. **[16]**

OR

Q2) Discuss basic principle of diffusion process and its application in chemical process industry. **[16]**

Q3) Give the analogies of the following with respect to Heat, Mass and Momentum transfer operations. **[16]**

a) Chilton Coulburn analogy.

b) Reynold's analogy.

OR

Q4) Write the equivalent corresponding number groups in Mass transfer for the following. **[16]**

a) j_H factor.

b) Nusselt number.

Q5) A plant manufacturing dry ice will burn coke in air to produce flue gas containing 15% CO_2 by volume. This will be passed into a sieve tray to wet scrubber at 1 atm and $25^{\circ}C$ to be scrubbed with mono ethyl amine solution. The recycle scrubbing liquid contains 0.058 molCO_2/mol solution. The gas leaving the

P.T.O

scrubber contains 2% CO_2 by volume. Assume isothermal operation. Determine the minimum L/G ratio. Determine the number of theoretical plates for 1.2 times L/G min for 0.5 m^3/sec of entering gas at 1.2 atm and $25^\circ C$. Equilibrium data is given as: **[18]**

Moles CO_2/ Moles solution	0.058	0.060	0.062	0.064	0.066	0.068	0.070
PCO_2 (mm Hg)	5.6	12.8	29	56	98.7	155	232

OR

Q6) Write short notes on absorption with chemical reaction. Give suitable example. **[18]**

SECTION - II

Q7) Derive an equation for height of packing required in forced draft counter current cooling tower in terms of Z = HTU x NTU. Use basic equations of heat and mass transfer in counter current cooling tower with necessary assumptions and a neat sketch. **[18]**

OR

Q8) For an air water vapor mixture of dry bulb temperature 650C a wet bulb temperature 350C was determined under conditions such that the radiation coefficient is negligible. The total pressure of the system is 1std atm. Compute the humidity of air. Data : λ_w = 2419300J/kg, Y_w = 0.0365 kg/kg, h_g/k_y = 950 kg/kg. **[18]**

Q9) Explain the following with a neat sketch, proper nomenclature and necessary assumptions. **[16]**

a) Constant drying rate period.

b) Falling drying rate period.

OR

Q10) A wet solid is to be dried from 36 to 10% moisture under constant drying conditions in 6 hrs. If Equilibrium moisture content is 4% and critical moisture content is 15% how long will it take to dry 6% moisture under same conditions. **[16]**

Q11) Explain the following terms in detail: **[16]**

a) Channeling.

b) Loading.

c) Flooding.

d) Weeping.

OR

Q12) Write short notes on: **[16]**

a) Sparged vessels.

b) Pressure drop characteristics in packed towers.

Total No. of Questions : 12]

SEAT No. :

P1040

[Total No. of Pages : 2

[4163] - 145
T.E. (Biotechnology)
INDUSTRIAL, ORGANIZATION AND MANAGEMENT
(Sem. - I) (2003 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the following functions of Management. **[8]**

i) Planning.

ii) Staffing.

b) Explain Line and staff organization along with advantages and disadvantages. **[8]**

OR

Q2) a) "Planning is looking ahead and control is looking back" comment. **[5]**

b) "Decision making is the primary task of the manager" comment. **[5]**

c) Differentiate partnership and proprietorship as a form of business. **[6]**

Q3) a) Discuss the role of Trade Unions in India. **[9]**

b) What is Job Evaluation? Explain any two methods of job evaluation. **[9]**

OR

Q4) a) What is Performance Appraisal? Explain its importance to organization. **[9]**

b) What is the basic difference between Wages and Incentives? Explain any two types of wages and give characteristics of good wages. **[9]**

Q5) a) Explain the process of purchase through quotation, tender and comparative statements. **[8]**

b) Explain various types' steps of quality control for manufacturing of fruit drinks. **[8]**

OR

P.T.O

Q6) a) Define inventory. Explain the different methods of Inventory Management. **[8]**

b) Write short notes on: **[8]**

i) Functions of Store keeper.

ii) LIFO, FIFO.

SECTION - II

Q7) a) Explain the role of advertising and promotion for growth of business. **[8]**

b) Explain various techniques of sales promotions. **[8]**

OR

Q8) a) What is market research? Explain the methods of market research. **[8]**

b) Write short notes on: **[8]**

i) Penetration prices and skimming prices.

ii) Channels of distribution.

Q9) a) Explain the necessity and advantages of ISO systems for Biotechnology industry. **[8]**

b) Explain the role of Export Promotion Council in promoting International Business. **[8]**

OR

Q10) a) State and explain the concept of Total Quality Management. **[8]**

b) Explain the following: **[8]**

i) Patent right and Copy right.

ii) Procedure of Import of goods in India.

Q11) a) What is flow diagram and flow process chart? Explain with example. **[9]**

b) Write short note on: **[9]**

i) FERA and FEMA.

ii) Concept of Motion and Time study.

OR

Q12) a) Define work study. Explain the objectives and procedures of work study. **[10]**

b) Write a short note on: **[8]**

i) Therbligs.

ii) Concept of Guarantee and warranty.

Total No. of Questions : 12]

SEAT No. :

P1041

[Total No. of Pages : 2

[4163] - 146
T.E. (Biotechnology)
IMMUNOLOGY
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Maximum marks for each question is given in parenthesis.***

SECTION - I

Q1) Describe the various specific defense mechanisms that the immune system employs to combat various pathogens. **[18]**

OR

Q2) Differentiate between Innate and Acquired immunity. What are the characteristics features of adaptive immunity? **[18]**

Q3) Answer the following: **[16]**

a) Write a note on inflammation and explain the role of histamine.

b) Describe the roles of various types of White Blood Cells.

OR

Q4) Write notes on: **[16]**

a) GVH.

b) li peptide chain of MHC class II.

Q5) Answer the following: **[16]**

a) Describe the process of phagocytosis.

b) Role of Thymus in T cell maturation.

OR

Q6) Answer the following: **[16]**

a) Draw a well labelled diagram of a typical IgG molecule that includes each immunoglobulin domain.

b) Explain - All antibodies exhibit specific binding to antigen.

P.T.O

SECTION - II

Q7) Explain briefly the different pathways for Complement activation. **[18]**

OR

Q8) What the different types of Hypersensitivity reactions. Explain the differences. **[18]**

Q9) Answer the following: **[16]**

a) Define vaccine and discuss the merits and demerits.

b) Differentiate between the primary and secondary response.

OR

Q10) Answer the following: **[16]**

a) Write a note on interferon and its role.

b) Write a note on role os eosinophils, basophiles and mast cells.

Q11) What are DNA vaccines? Explain the advantages and disadvantages. **[16]**

OR

Q12) Write short notes: **[16]**

a) Autoimmunity.

b) Recombinant vaccines.

c) Cytokines.

d) Natural killer cells.

Total No. of Questions : 11]

SEAT No. :

P1042

[Total No. of Pages : 3

[4163] - 147
T.E. (Biotechnology)
INSTRUMENTATION AND PROCESS CONTROL
(Sem. - II) (2003 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams should be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe visualization by shadow graph and interferometer. **[8]**

b) Explain how Pirani gauge is used for low pressure measurements. **[8]**

OR

Q2) Write short notes on: **[16]**

a) Resistance Thermometer.

b) Measurement of diffusivity in gases.

c) Hot wire ammometer.

d) Bellows pressure gauge.

Q3) a) A process of unknown transfer function is subjected to an unit impulse input. The output of the process is measured accurately and is found to be represented by the function $y(t)=te^{-t}$. Determine the unit step response of this process. **[8]**

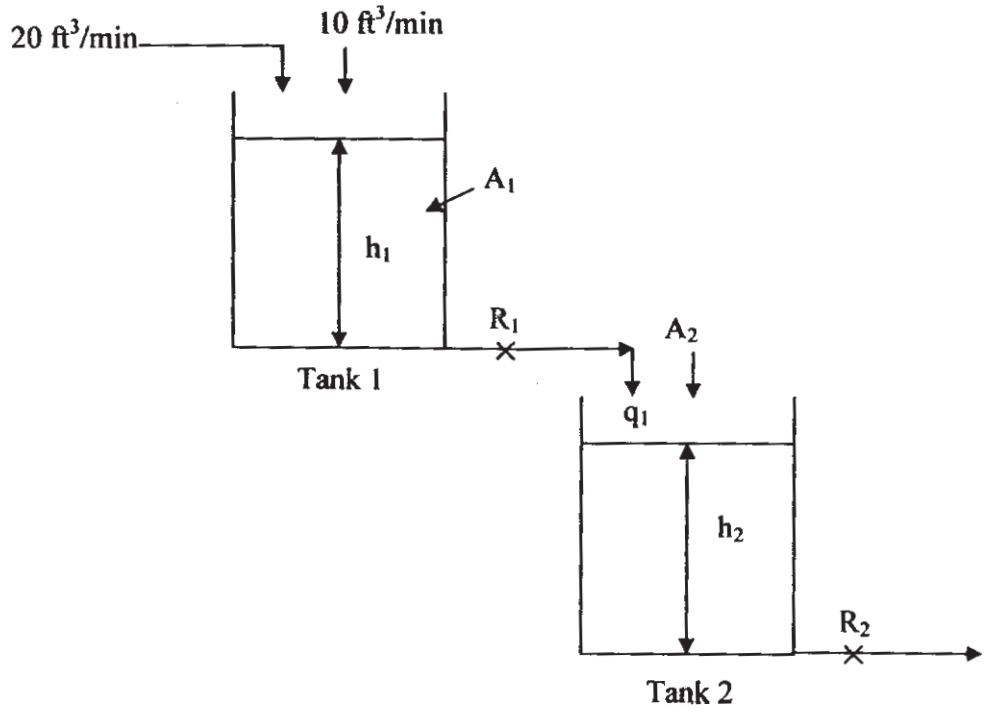
b) A two tank system shown in the figure below is operating at steady state. At time t = 0, 10 ft^3 of water is quickly added to the first tank. Determine the maximum deviation in level (feet) in both tanks from the ultimate steady state values and the time at which each maximum occurs. **[8]**

Data : $A_1 = A_2 = 10ft^2$

$R_1 = 0.1$ ft / cfm

$R_2 = 0.35$ ft/cfm

P.T.O

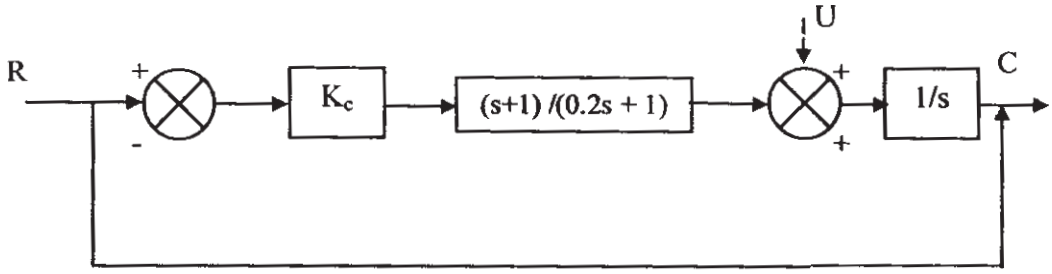


OR

Q4) a) Derive the transfer function for a two tank interacting system. **[8]**

b) Derive the response of a second order system for a step change in input. Explain the responses based on the values of the damping coefficient. **[8]**

Q5) a) For a control system shown in the figure below, find: **[9]**



i) Closed loop transfer function C/U.

ii) Value of K_c for which the system is stable.

b) With the help of a neat sketch, compare the control actions of different types of controllers. **[9]**

OR

Q6) a) A step input is given to a PI controller. Plot the output of the controller if $K_c = 2$ and $\tau_1 = 0.5$ min. **[6]**

b) Derive the closed loop transfer function for a servo problem. **[6]**

c) For a control system having the characteristic equation. **[6]**

$s^4 + 4s^3 + 6s^2 + 4s + (1 + k) = 0$

Determine the value of K above which the system is unstable.

SECTION - II

Q7) a) Plot the root locus diagram for the following control system. **[8]**

$$1+\frac{K_c(0.5s+1)}{s(s+1)(2s+1)}$$

b) Explain the Zeigler Nichols tuning rules in detail. **[8]**

OR

Q8) a) Plot the Bode diagram for the system whose overall transfer function is

$$\frac{1}{(s+1)(s+5)}$$

[8]

b) Explain in brief the following terms: **[8]**

i) Poles of transfer function.

ii) Gain margin.

iii) Bode stability criterion.

iv) Asymptotes.

Q9) a) With the help of a neat sketch, explain the feed forward control system. **[8]**

b) Write notes on the following: **[8]**

i) Over ride control and its applications.

ii) Ratio control.

OR

Q10) Write notes on the following: **[16]**

a) Cascade control system.

b) Selective control.

Q11) Write short notes on the following (any three): **[18]**

a) Adaptive control.

b) Fuzzy logic.

c) pH control in fermenter.

d) Speed control in fermenter.

e) Redox measurement.

Total No. of Questions : 12]

SEAT No. :

P1043

[Total No. of Pages : 2

[4163] - 148
T.E. (Biotechnology)
Computational Techniques and Process Modeling
(Sem. - II) (2003 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I & any three questions from Section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Use of Programmable calculator is not allowed.***
4) ***Draw a neat sketch wherever necessary.***
5) ***Make necessary assumptions wherever required.***

SECTION - I

Q1) a) Solve by Guass Siedal method: **[8]**

$10x + 2y + z = 9$

$2x + 20y - 2z = -44$

$-2x + 3y + 10z = 22$

b) Define the following: **[8]**

i) Characteristic equation.

ii) Eigen values and Eigen vectors.

OR

Q2) Find the characteristic roots and vectors of the matrix. **[16]**

$$\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$$

Q3) Using Modified Eulers method find a real root for y at $x = 0.3$ of the equation $dy / dx = x + y + xy$ taking $y(x) = 1$ and $h = 0.025$ **[18]**

OR

Q4) Evaluate by using Trapezoidal rule and Simpsons 1/3 rd rule $\int e^x \, dx$ taking six intervals from 0 to 0.6. **[18]**

P.T.O

Q5) Given the data, find the fifth and tenth term of the series. **[16]**

x	3	4	5	6	7	8	9
y	2.7	6.4	12.5	21.6	34.3	51.2	72.9

OR

Q6) Evaluate $\Delta(2x+1)/(x^2+7x+12)$. **[16]**

SECTION - II

Q7) Model a CSTR with 2nd order reaction kinetics with the following reactions taking place. **[16]**

a) Consecutive reactions.

b) Reversible reactions.

OR

Q8) Explain Process modeling and simulation with suitable example. What are the principles of formulation of a process model? **[16]**

Q9) Derive the modeling equations for a Batch distillation column with a neat sketch and necessary assumptions. **[16]**

OR

Q10) Derive the modeling equations for a plug flow reactor in which chemical reaction with simultaneous mass transfer takes place. **[16]**

Q11) Give short notes on: **[18]**

a) Trickle bed reactors.

b) Tower aerobic reactors.

OR

Q12) Define unlimited cell growth kinetics. Write the modeling equations for a Chemostats? **[18]**

Total No. of Questions : 12]

SEAT No. :

P1044

[Total No. of Pages : 2

[4163] - 150
T.E. (Biotechnology)
MASS TRANSFER - II
(2003 Pattern) (Sem. - II) (Common to Chemical)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from Section - I & any three questions from Section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Use of Programmable calculator is not allowed.***
4) ***Draw a neat sketch wherever necessary.***
5) ***Make necessary assumptions wherever required.***

SECTION - I

Q1) Define Reflux ratio. Derive Fenske equation for number of theoretical stages at total reflux conditions? **[16]**

OR

Q2) Explain with neat sketch Azeotropic distillation? **[16]**

Q3) Give classification of membrane processes. Why membrane separations are preferred over conventional separation processes. Explain. **[16]**

OR

Q4) Write short notes on Microfiltration. Derive the equations for salt flux and water flux in microfiltration. **[16]**

Q5) Derive the material balance equations for a two stage cross current adsorption operation. Deduct the equation for minimum adsorbent requirement. **[18]**

OR

Q6) Prepared cotton seeds containing 35% extractable oil are fed to a continuous countercurrent extractor using hexane as a solvent. The system contains ten sections, each section efficiency being 50%. The entrainment is constant with a value of 1 kg solution / kg solids. Calculate the oil concentration in the outlet solvent if the oil content in the seeds is to be reduced to 0.5% by weight. **[18]**

P.T.O

SECTION - II

Q7) Derive the material balance equations for multistage countercurrent leaching process with necessary assumptions and a neat sketch. **[18]**

OR

Q8) Derive an expression for finding number of stages required in case of multistage crosscurrent leaching operation. **[18]**

Q9) Derive the Solute Solvent, and Overall mass balance equations of general crystallizers. State the assumptions taken. **[16]**

OR

Q10) Explain the construction and working of Vacuum crystallizer. **[16]**

Q11) What are the factors effecting the choice of the solvent in an extraction process. Explain. **[16]**

OR

Q12) Write short notes on Bollman extractor with a neat sketch. Explain its construction, principle and working. List out its applications. **[16]**

Total No. of Questions : 12]

SEAT No.:

P1500

[Total No. of Pages : 3

[4163]-27
T.E. (Mech./Mech. Sandwich)
MECHATRONICS
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by measurement systems? And explain components of measurement system. **[8]**

b) Explain working of Rotameters and anemometer with suitable sketches. **[8]**

OR

Q2) a) What is working principle of Mcleod Gauge with neat sketch. **[8]**

b) Explain different static characteristics parameters used in measurement techniques. **[8]**

Q3) a) Explain principle and working of LVDT and also explain how LVDT determines direction of motion? **[8]**

b) Compare temperature measuring sensors such as thermocouple, RTD. **[8]**

OR

Q4) a) What is meant by gauge factor in strain gauge and derive its relation considering wheatstone bridge. **[8]**

b) Explain working of ultrasonic level measuring sensors and compare with conventional method of float. **[8]**

Q5) a) Derive relation for Spring Mass Damper Model and determine its transfer function. **[9]**

b) Compare Close loop and open loop control system based on its stability, response and draw neat suitable sketch. **[9]**

P.T.O.

OR

Q6) a) Derive mathematical model of room based on thermal system. **[9]**

b) Write a short note on : **[9]**

i) Transfer function.

ii) Close loop control system.

SECTION - II

Q7) a) Explain following terms with respect to control system : **[8]**

i) Feed Back and Feed Forward Control System.

ii) Regulator System.

iii) ON-OFF type control.

b) Give comparison of (1) P (2) PI & (3) PID control actions. **[8]**

OR

Q8) a) Explain working of Proximity switch and give suitable application example. **[8]**

b) Short note on : **[8]**

i) Bode Plot.

ii) Stability of System.

Q9) a) What is ADC and why sample and hold circuit is used in ADC. **[8]**

b) Explain working of JK flip-flop and Master Slave Flip Flop. **[8]**

OR

Q10) a) Explain working of IC 555 with pin diagram. **[8]**

b) Explain working of Inverting and Non-Inverting Op-Amps and its applications. **[8]**

Q11) a) Explain application of PLC system for following case studies. **[9]**

i) Bottle Filling Machine.

ii) Elevator.

b) Construct the ladder logic diagrams for **[9]**

i) The NAND gate and

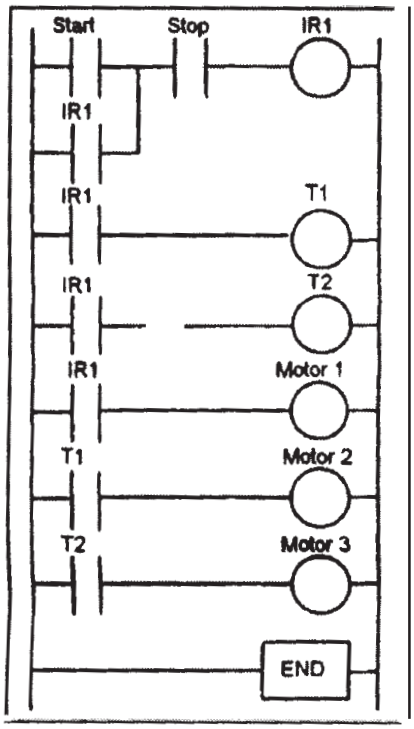
ii) The NOR gate.

Also develop a truth table for both logics.

OR

Q12) a) Explain working of PLC and factors to be considered for selection of PLC. **[9]**

b) List the steps the PLC takes to execute the ladder diagram program shown in the sketch. **[9]**



Total No. of Questions : 12]

SEAT No.:

P1501

[Total No. of Pages : 4

[4163]-39
T.E. (Production)
DIE AND MOULD DESIGN
(2003 Pattern) (Sem. - II) (Common with Prod. S/W)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***From Section-I solve, Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, and from Section-II solve Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design a blanking die for the blank in fig.1. (Given :- $\tau = 250 N/mm^2$).

a) Draw a best strip layout and find out material utilization, strip is cut from sheet of size 2500mm × 1250mm × 1.4mm thick. **[4]**

b) Find out cutting force and press tonnage with full share. **[4]**

c) Draw and design a die block. **[4]**

d) Draw assembly drawing i.e. front view of press tool and dic plan (plan view of press tool without assembly of upper shoe). **[6]**

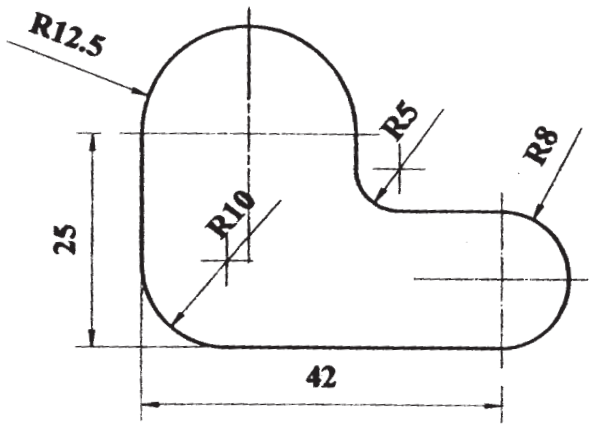


Fig. 1: Structural steel 1.4mm thick

OR

Q2) Design a progressive die for the component shown in fig.2.
(Given :- $\tau = 360 N/mm^2$)

a) Draw strip layout showing on it the position of feed stopper, starting stoppers and stations. **[2]**

b) Find out press tonnage by considering full shear and staggering. **[4]**

c) Draw and design a die block and find out punch and die size at each station. **[6]**

d) Draw assembly drawing i.e. front view of press tool and die plan (plan view of press tool without assembly of upper shoe). **[6]**

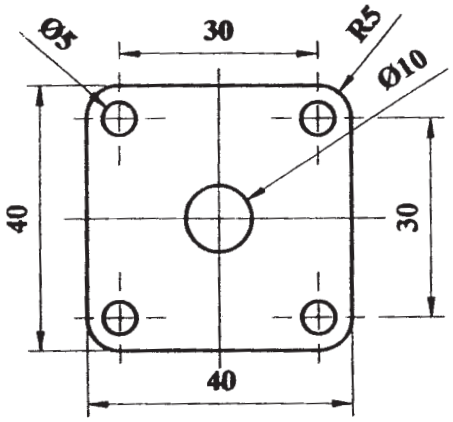


Fig. 2: Structural steel 1mm thick

Q3) a) Find out the blank size by graphical method for drawn component shown in fig.3. And the number of draws required. **[6]**

b) What is spring back? Explain the different methods of reducing spring back and which one is used for the bend component in fig.4. **[6]**

c) Calculate the bending force required for bend the component as shown in fig.4. **[4]**

OR

Q4) a) Calculate the blank size and number of draws required for the drawn component in fig.3. **[4]**

b) Design and draw punch and die for the Ist draw. Also find out cup size after Ist draw. **[6]**

c) Calculate drawing and blanking force for Ist draw. **[2]**

d) Find out develop length for the bend component in fig.4. **[4]**

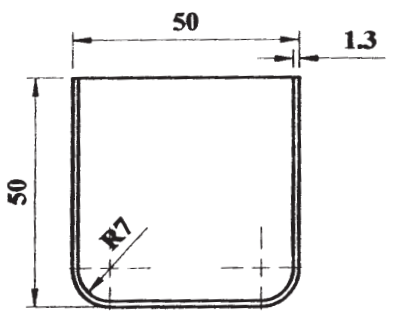


Fig. 3: Drawing component

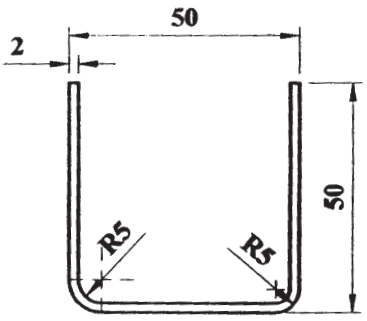


Fig. 4: Bending component

Q5) Design close die forging for the component shown in fig.5.

a) List the forging operation required to convert the raw material into forging. **[1]**

b) Design edging impression. **[6]**

c) Calculate stock size. **[3]**

d) Design finish impression. **[6]**

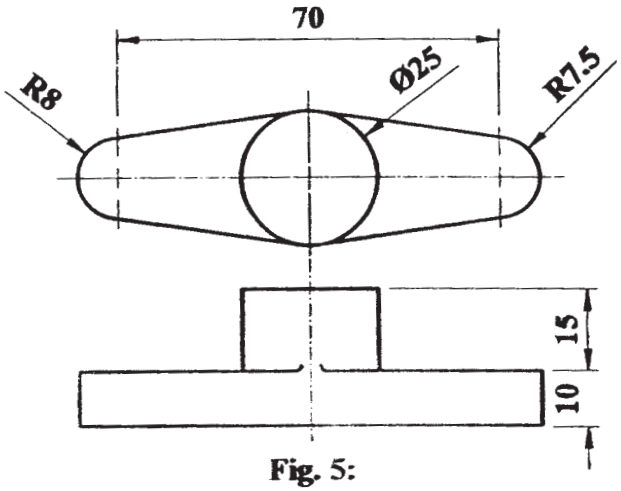


Fig. 5:

OR

Q6) Explain the rules of upsetting with designing upset die for the component as shown in fig.6. **[16]**

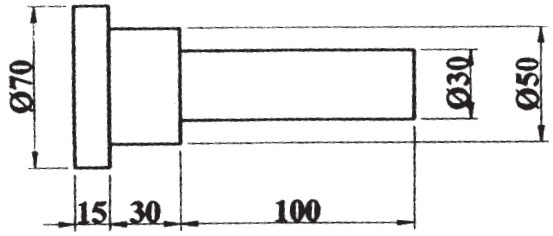


Fig. 6

SECTION - II

Q7) a) Explain with neat sketch ejection system in die-casting. **[8]**

b) Explain types of core in die-casting. **[8]**

OR

Q8) a) Explain with neat sketch cold chamber die-casting. **[8]**

b) Explain different die locking methods. **[8]**

Q9) Write short note on :

a) Compression moulding. **[5]**

b) Insert cavity and core. **[6]**

c) Extrusion. **[5]**

OR

Q10) a) Explain the function of following mould parts. **[6]**

i) Guide post and guide bush.
ii) Register ring.
iii) Local insert.
iv) Core.
v) Cavity.
vi) Sprue bush.

b) Write notes on :

i) Bolster. **[5]**
ii) Ejection grid. **[5]**

Q11) Design a single impression injection mould to produce any one of the component shown in fig.7a and fig.7b. The component is to be manufacture in high impact polystyrene. The drawing should include a plan view of the moving half and side sectional view of both halves. Following point should be consider while designing.

a) General construction.
b) Ejection system.
c) Feed system.
d) Cooling system. **[18]**

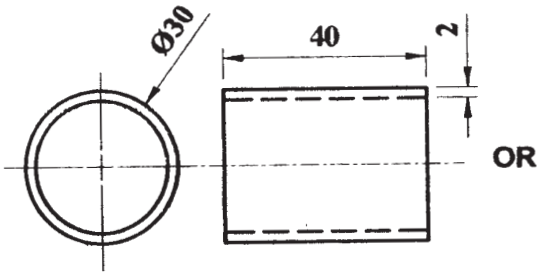


Fig. 7a

OR

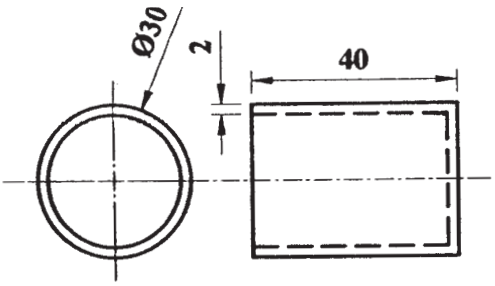


Fig. 7b

OR

Q12) a) Explain any two types for ejector plate return system. **[8]**

b) What is stop pin in injection moulding? **[2]**

c) What rectangular edge gate and 50mm long runner dimensions are required for moulding PVC box the dimension of which is as follows?

Length = 100mm; width = 100mm; depth = 50mm.
Given; PVC constant (n) = 0.9; PVC density = 1.39gm/cm^3
Also find out runner diameter. **[8]**

Total No. of Questions : 12]

SEAT No.:

P1502

[Total No. of Pages : 4

[4163]-44
T.E. (Electrical)
CONTROL SYSTEM - I
(2003 Pattern) (Sem. - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give the comparison of Open Loop and Closed Loop Systems. **[6]**

b) What is transfer function of a system. Give its significance. **[4]**

c) Reduce the block diagram shown in fig.1c and obtain its closed loop transfer function $\frac{C(S)}{R(S)}$. **[6]**

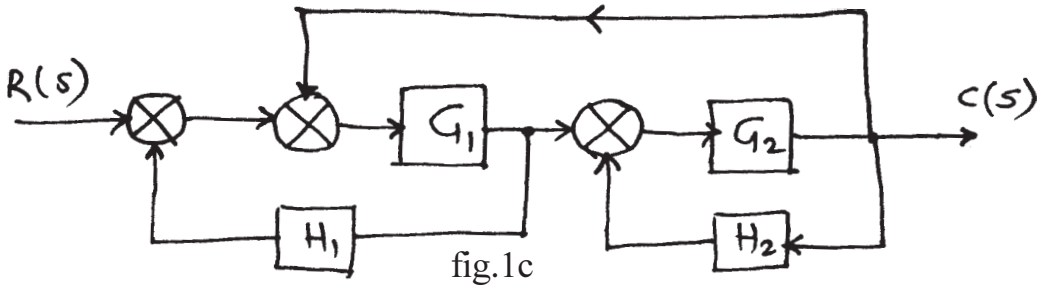


fig.1c

OR

Q2) a) Find the overall transfer function C (s)/R(s) of the system having signal flow graph as shown in fig.2a. **[8]**

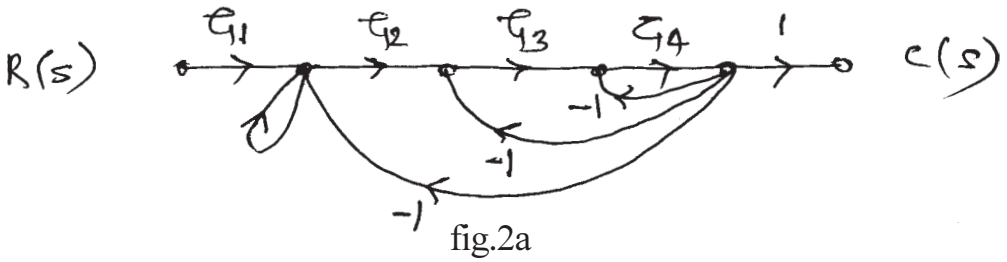


fig.2a

P.T.O.

b) Develop the Electrical Analog of the mechanical system shown in fig.2b. Use Force-Voltage analogy. **[8]**

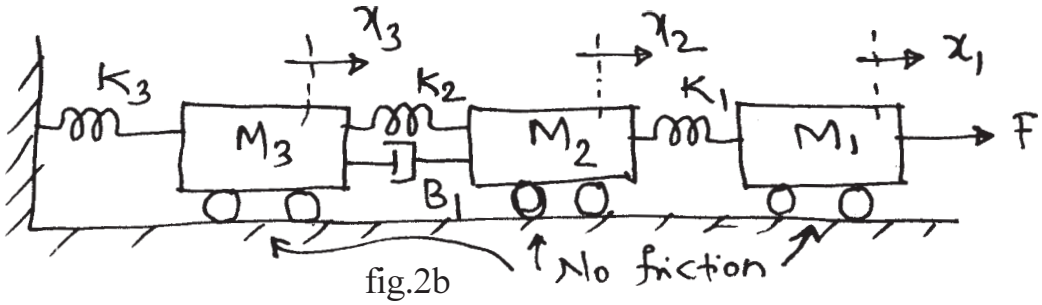


fig.2b

Q3) a) With necessary sketches, state and discuss standards test signals. **[6]**

b) A unity feedback system has $G(s)=\frac{40(s+s)}{s(s+1)(s+4)}$.

Determine :

i) Type of the system.
ii) All error coefficients and steady state error for a ramp input of 4t. **[6]**

c) With the help of a neat sketch, explain, the time response specifications for a under-damped system with unit step input. **[6]**

OR

Q4) a) Derive the static error coefficients and steady state error for type 1 system with **[6]**

i) Unit step input.
ii) Unit ramp input.
iii) Unit parabolic input.

b) A unit step input is applied to the unity feedback system for which open loop transfer function is $G(s)=\frac{16}{s(s+8)}$.

Find :

i) Its closed loop Transfer Function.
ii) Natural frequency of oscillations.
iii) Damping ratio.
iv) Damped frequency of oscillations. **[6]**

c) Describe PD and PI Controllers briefly giving their effects on time response. Write the transfer function. **[6]**

Q5) a) Define the following terms : **[8]**

i) Stable System.
ii) Unstable System.
iii) Critically Stable System.
iv) Conditionally Stable System.

b) Explain Routh-Hurwitz criterion for determining the stability of a system. State demerits of this criterion. **[8]**

OR

Q6) a) Sketch the root locus of a unity feedback system whose open loop TF is given by $G(s)H(s)=\frac{K}{s(s+2)(s+3)}$ **[10]**

b) Find marginal K for a system whose characteristic equation is given by $S^4 + 22s^3 + 10s^2 + s + k = 0$. **[6]**

SECTION - II

Q7) a) Discuss the following in brief : **[8]**

i) Phase Margin.
ii) Gain Margin.
iii) Gain crossover frequency and
iv) Phase cross over frequency in reference to Bode Plot.

b) A unity feedback control system has open loop transfer function as $G(s)=\frac{100}{s(1+0.1s)(1+0.2s)}$ sketch the bode plot and determine from it.

i) Gain Cross over frequency.
ii) Phase cross over frequency.
iii) Gain Margin.
iv) Phase Margin.
v) Closed loop stability of the system. **[10]**

OR

Q8) a) For a second order control system, discuss the co-relation between time response specifications and frequency response specifications. Hence derive the expressions for Resonant Peak and Resonant frequency. **[10]**

b) Give the merits and demerits of frequency domain techniques. **[8]**

Q9) a) State and explain the Nyquist criterion. **[6]**

b) Draw the Nyquist plot for the system $G(s)H(s)=\frac{40}{(s+4)(s^2+2s+2)}$.

Find :

i) Gain margin in dB.

ii) Phase cross-over frequency.

Also comment on its stability. **[10]**

OR

Q10) a) What is a Polar Plot? How is it used to find the stability of a control system? **[6]**

b) Sketch and explain the polar plots for Type '0', Type '1' and Type '2' systems. **[10]**

Q11) a) Explain the design procedure for designing a lead compensator using root locus technique. **[8]**

b) Design a suitable phase lead compensation network using Bode plot for

$G(s)H(s)=\frac{12}{s(s+1)}$. **[8]**

OR

Q12) a) Explain the phase lead design using Bode Plot. **[8]**

b) Explain the phase lag design using root locus. **[8]**

Total No. of Questions : 12]

SEAT No.:

P1503

[Total No. of Pages : 3

[4163]-53
T.E. (Electronics/E & TC)
DIGITAL COMMUNICATION
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Find power spectral density of a random process $X(t) = A \cos(\omega t + \Phi)$, where Φ is random variable uniformly distributed in the interval of $(0, 2\pi)$. **[8]**

b) With the suitable spectral diagram prove the sampling theorem and explain aliasing effect. **[8]**

OR

Q2) a) With the help of mathematical support explain stationary random process, non-stationary random process, wide sense stationary process and ergodic process. **[8]**

b) The signal $x(t) = \cos(200\pi)\, t + 0.25 \cos(700\pi)\, t$ is sampled at the rate of 400 samples per second. The signal is then passed through the ideal low pass filter with 200 Hz bandwidth. Write expression for filter output and sketch the spectrum of sampled waveform. **[8]**

Q3) a) Analog signal with 6 kHz bandwidth with dynamic range of 2 volts is sampled with 16 kHz sampling and encoded with 8 bit PCM encoder. Find out : **[9]**

i) Rate of transmission.
ii) Quantization noise.
iii) Bandwidth requirement.
iv) If 4 channels are multiplex with above scheme what will be the required bandwidth.

P.T.O.

b) Explain the working of delta modulator with block diagram and waveform. What is the advantage of delta modulator? What is the drawback? Justify your answer with example. Derive the expression for quantization noise. **[9]**

OR

Q4) a) Analog sinusoidal test signal with peak amplitude of 1.5 volts with signal frequency of 2 kHz is applied to the delta modulator. Signal is sampled by sampling frequency of 25 kHz. Find out the minimum step size required to avoid slop overload distortion. Compute quantization noise power. **[9]**

b) Explain with detailed block diagram and waveforms the working of adaptive delta modulation and differential PCM. **[9]**

Q5) a) What are the desirable properties of line codes? Draw waveforms for following line codes in synchronization with clock signal. Input bit sequence is 1011001011.

i) RZ Polar.
ii) NRZ Polar.
iii) AMI.
iv) Manchester. **[8]**

b) Derive the expression for PSD of polar signal [i.e. 'l' represented by = p(t) and '0' by – p(t)]. Consider symbols 1 and 0 are equiprobable. **[8]**

OR

Q6) a) With the help of suitable example explain the need of scrambling. **[8]**

b) What is the need of bit/frame synchronization? Explain any one method of bit synchronization. **[8]**

SECTION - II

Q7) a) With the help of block diagram and mathematical expression explain the operation of offset QPSK. Draw signal space representation for the same. **[8]**

b) Explain M-ary FSK system and plot the spectrum and comment on the bandwidth requirement. **[8]**

OR

Q8) a) What is the advantage of MSK over QPSK? Why it is called as MSK and how to select f_H and f_L. **[8]**

b) With the help of block diagram explain the working of DPSK and DEPSK. **[8]**

Q9) a) Derive the expression for signal to noise ratio for integrate and dump type receiver. **[8]**

b) State the properties of matched filter. How to find the impulse response? **[8]**

OR

Q10) a) Show that performance of correlator and matched filter are identical. **[8]**

b) Derive the expression for probability of error of BPSK. **[8]**

Q11) a) Explain FH-SS modulation and demodulation. What is slow frequency hopping and fast frequency hopping. Explain the relation between bit rate, chip rate and hop rate. **[10]**

b) Explain with suitable example properties of PN sequence used in spread spectrum system. **[8]**

OR

Q12) a) Derive the expression for the probability of error in DS-SS modulation with single tone interference. What is processing gain? **[9]**

b) Explain CDMA, FDMA and TDMA in detail. **[9]**

☒☒☒☒

Total No. of Questions : 12]

SEAT No.:

P1504

[Total No. of Pages : 3

[4163]-87
T.E. (Chemical)
TRANSPORT PHENOMENA
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Derive the velocity profile and momentum profile for a Newtonian fluid through a circular pipe inclined at angle β. Find the ratio of maximum velocity to the average velocity. **[12]**

b) Write Eulers equation and discuss its utility. **[3]**

c) Explain the difference between normal and shear stress. **[3]**

OR

Q2) a) How the equation of continuity simplified for steady state flow? **[4]**

b) Write shell momentum balance at steady state. **[4]**

c) What are time smooth quantities used in the analysis of turbulent flow. **[4]**

d) State and explain the law of conservation of mass of species A in a binary system. **[6]**

Q3) a) Determine the ratio $\mu^{(t)}/\mu$ at S = R/2 for water flowing at a steady state in a long smooth round tube under the following conditions.

R = tube radius = 3 in

τ_0 = wall shear stress = 2.36×10^{-5} lb_f in^{-2}

ρ = density = 62.4 lb_m ft^{-3}

υ = kinematic viscosity = 1.1×10^5 ft^2 sec^{-1} **[8]**

b) Compare the friction factor for flow in tubes and flow around sphere. **[8]**

P.T.O.

OR

Q4) a) Deirve Navier stokes equation for a system of horizontal parallel plates. Fluid flow is laminar with constant density and viscosity. The flow is driven by pressure gradient under isothermal condition. **[12]**

b) Discuss friction factors for packed columns. **[4]**

Q5) a) Explain Chapman-Enskog theory for monoatomic gas at low density. **[10]**

b) An electric current of 200 Amp is passed through stainless steel vessel having radius r = 1.26mm and length L = 91cm. The wire has a resistance of 0.126Ω. The outer surface temperature T_w is held at 422.1K. The average thermal conductivity is K = 22.5W/m.k. Calculate the centreline temperature. **[6]**

OR

Q6) a) Explain heat transfer coefficients for forced convection in tubes. **[8]**

b) A copper wire has a radius of 2mm and a length of 5m. For what voltage drop would the temperature rise at the wire axis be 10ºC, if the surface temperature of the wire is 20ºC. **[8]**

SECTION - II

Q7) a) Heat is flowing through an annular walls of inside radius r_o and outside radius r_i. The thermal conductivity varies linearly from K_0 at T_0 to K_1 at T_1. Develop an expression for heat flow through the wall at $r = r_0$. **[10]**

b) Explain Deisslers Empirical formula for the region near the wall. **[6]**

OR

Q8) a) What is Von Karman similarity hypothesis? **[6]**

b) A standard schedule 40, two inch steel pipe (inside diameter 2.067 in) carrying steam is lagged with 2 in. of 85% magnesia covered in turn with 2 in. of cork. Estimate the heat loss per hour per foot of pipe if the inner surface of cork is at 250ºF and the outer surface of the cork is at 90ºF. The thermal conductivities of the substances concerned are : **[10]**

Material	Conductivity Btu/hr.ft.f
Steel	26.1
85 percent magnesia	0.04
Cork	0.03

Q9) a) Explain in brief the hydrodynamic theory and Stokes-Einstein relation. **[8]**

b) The value of D_{AB} for a dilute solution of methanol in water at 15ºC is $1.28 \times 10^{-5} cm^2/s$. Calculate D_{AB} for the same solution at 100ºC, using the Wilke-Chang equation.

μ_1 at 15ºC = 1.14Cp

μ_2 at 100ºC = 0.284 Cp. **[8]**

OR

Q10) a) Derive equation of molar flux for diffusion with heterogeneous chemical reaction. **[8]**

b) Explain concentration fluctuations and time smoothed concentration. **[8]**

Q11) a) Compare Ficks law of diffusion with Newtons law of viscosity and fouriers law of thermal conductivity, state the analogous relation. **[6]**

b) What is physical significance of flux ratio. **[6]**

c) Explain chilton and colburn J-factor analogy. **[6]**

OR

Q12) a) Discuss transfer coefficients at high mass transfer rates for peritration theory. **[6]**

b) Write note on macroscopic and microscopic balance. **[6]**

c) Explain diffusion in Laminar Falling Film. **[6]**

Total No. of Questions : 12]

SEAT No.:

P1505

[Total No. of Pages : 4

[4163]-91
T.E. (Petroleum Engineering)
MATHEMATICAL METHODS FOR PETROLEUM ENGINEERING
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***In section-I : Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6. In section-II : Attempt Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) If $\nu = 3x^2y - y^3$ find its harmonic conjugate u. Find $f(z) = u + iv$ in terms of z. **[6]**

b) Show that analytic function $f(z)$ with constant modulus is constant. **[5]**

c) Express Laplace equation $\frac{\partial^2\varphi}{\partial x^2}+\frac{\partial^2\varphi}{\partial y^2}=0$ in terms of z and $\bar{z}$. **[6]**

OR

Q2) a) Find the analytic function whose imaginary put $\nu = e^x \sin y$. **[6]**

b) Verify whether $f(z) = xy + iy$ is analytic. **[5]**

c) If $f(z)$ is analytic, show that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)^2|$ **[6]**

Q3) a) Evaluate $\oint\frac{z^2+1}{z-2}dz$ where **[5]**

i) Cis the circle $|z - 2| = 1$,

ii) Cis the circle $|z| = 1$.

P.T.O.

b) Evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta$. **[5]**

c) Find the bilinear transformation which sends the points 1, i, – 1 from z plane into the points i, 0, – i of the w-Plane. **[6]**

OR

Q4) a) Evaluate $\oint_c \frac{z \sec z}{(1-z)^2} dz$ where Cis $|z| = 3$. **[5]**

b) Show that the transformation $w = \frac{z-b}{z+b} b>0$ maps the right half of the z-plane in to the unit wide $|w| < |\cdot$ **[6]**

c) Find the invariant points of the transformation $w = \frac{2z - 6}{z - 2}$. **[5]**

Q5) a) Calculate the first four moments of the following distribution about the mean and find β_1 and β_2. **[7]**

x	0	1	2	3	4	5	6	7	8
f	1	8	28	56	70	56	28	8	1

b) Find the value of (1) mean $\bar{x}$ and $\bar{y}$ and (2) the correlation coefficient given the following regression lines. **[6]**

$y = 0.516x + 33.73$

$x = 0.512y + 32.52$

c) Ten percent of articles from a certain machine are defective. What is the probability that there will be 6 defectives in a sample of 25. **[4]**

OR

Q6) a) Fit Poisson's distribution to following data and calculate theoretical frequencies. **[6]**

x	0	1	2	3	4
f	122	60	15	2	1

b) The average test marks in a particular class is 59 and S.D. is 9. If the marks are normally distributed how many students in class of 70 received marks below 50 and more than 70.

Area for $z = 1$ is 0.3413

Area for $z = 1.22$ is 0.3888 **[6]**

c) Find S.D. of y given correlation coefficient is 0.8 covariance is 20 and $\sigma_x^2 = 16$. **[5]**

SECTION - II

Q7) a) With usual notations, establish the following : **[9]**

i) $\Delta = \mu\delta + \frac{1}{2}\delta^2$.

ii) $\frac{1}{\nabla} y_n - \frac{1}{\Delta} y_0 = y_0 + y_1 + y_2 \ldots . y_n$.

iii) $hD = \log E$.

b) For the tabulated data : **[8]**

x	1	1.2	1.4	1.6	1.8	2
y	0.0	0.128	0.544	1.296	2.432	4.00

Find y at $x = 1.1$ and $\frac{dy}{dx}$ at $x = 1.85$

OR

Q8) a) Use Simpson's $\frac{3}{8}^{\text{th}}$ rule to evaluate $\int_0^{\pi/2} \sqrt{\sin x + \cos x}\, dx$, dividing the interval into six parts write algorithm for above method. **[9]**

b) For the following data : **[8]**

x	2	6	10	14	18
$f(x)$	21.857	21.025	20.132	19.145	18.057

Find $f(11)$ using Stirling's formula.

Q9) a) Solve the equation $e^x - 5x = 0$ using method of successive approximations, taking initial guess as $x = 0.15$ perform six iterations.
Write the algorithm for above method. **[9]**

b) Use method of least squares to fit a curve of the form $y = ax^b$ to the following data : **[8]**

x	2	3	4	5	6	7
y	9.2	11.3	13.5	15.4	17.7	20

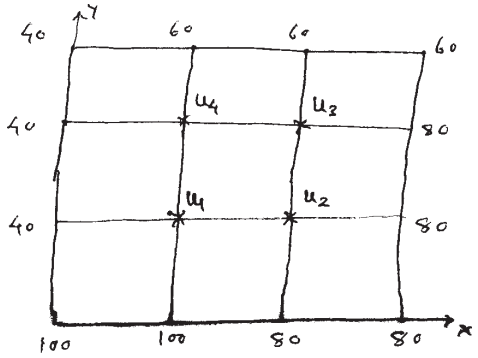
OR

Q10) a) Solve the system of equations by Gauss-Seidel method. **[8]**

$28x_1 - 5x_2 + 2x_3 = 26$
$4x_1 + 54x_2 - 5x_3 = 91$
$2x - 6x_2 + 26x_3 = 68$

b) Use Runge-Kutta method of 4th order to solve the equation $\frac{dy}{dx} = x + y^2$ given that $y(1) = 2$, $h = 0.2$ find y at $x = 1.2$ and $x = 1.4$. **[9]**

Q11) a) Given the values of $u(x, y)$ on the boundary of the square in the following figure. Evaluate the function $u(x, y)$ satisfying the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of the figure. **[9]**



b) Use simplex technique to solve the LP problem. **[7]**

Maximize $Z = 5x_1 + 3x_2$
Subject to $x_1 + 2x_2 \leq 400$,
$x_1 + x_2 \leq 600$
$x_1, x_2 \geq 0$

OR

Q12) a) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ using explicit finite difference method, subject to the conditions $u(0, t) = 0$, $u(1, t) = 0$, $u(x, 0) = \sin \pi x$ $0 \leq x \leq 1$ taking $\delta x = 0.1$, $\delta t = 0.002$, find $u(x, t)$ at the nodal points at t = 0.002, $t = .004$, $t = 0.006$. **[9]**

b) Solve the following LP problem, using simplex technique. **[7]**

Maximize $z = 6x_1 + 3x_2 + 2x_3$
Subject to the constraints
$2x_1 + 2x_2 + 3x_3 \leq 300$
$2x_1 + 2x_2 + x_3 \leq 120$
$x_1, x_2, x_3 \geq 0$

Total No. of Questions : 12]

SEAT No.:

P1508

[Total No. of Pages : 4

[4163]-111
T.E. (Polymer Engineering)
MATHEMATICAL METHODS IN POLYMER ENGINEERING
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***In section-I attempt Q. No. 1 or Q. No. 2, Q. No.3 or Q. No. 4, Q. No. 5 or Q. No.6. In section-II attempt Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Establish the following : **[9]**

i) $\Delta\nabla = \nabla\Delta = \delta^2$.

ii) $E = 1 + \frac{\delta^2}{2} + \delta\left\{1 + \frac{\delta^2}{4}\right\}^{\frac{1}{2}}$.

iii) $E = 1 + \Delta = e^{hd}$

b) Construct the forward difference table for $y = \sin x$, $x = 10^\circ (5^\circ) 35^\circ$ and find sin 12.5° and cos (12.5°) using forward difference formulae. **[8]**

OR

Q2) a) Using Newton-Raphson method, find a root of the equation $x^3 - 3x^2 - 5.5x + 9.5 = 0$.
Write the algorithm for the above method. **[9]**

b) Use Regula-Falsi method to find the real root of the equation $xe^x - 4\cos x = 0$ at the end of fifth iteration. **[8]**

Q3) a) Evaluate $\int_0^3 \frac{dx}{1+x}$ with seven ordinates by using Simpson's $\frac{3}{8}^{th}$ rule and hence calculate log 2. What is the percentage error involved? **[8]**

P.T.O.

b) Use Runge-Kutta method to solve the equation $\frac{dy}{dx}=\frac{y-x}{y+x}$ with $y(0) = 1$ and $h = 0.2$ find y at $x = 0.2$. **[8]**

OR

Q4) a) For the tabulated data : **[8]**

x	10	11	12	13	14	15	16
$f(x)$	95.90	96.85	97.77	98.68	99.56	100.41	101.24

Use Simpson's $\frac{1}{3}^{rd}$ rule to evaluate $\int_{10}^{16} f(x)\,dx$.

b) Determine using modified Euler's method the value of y at $x = 0.1, 0.2$ correct to four decimal places, given that $\frac{dy}{dx} = x^2 + y, y(0) = 1, h = 0.1$. **[8]**

Q5) a) Solve the system of equations by Gauss-seidel method. **[8]**

$83x_1 + 11x_2 - 4x_3 = 95$

$7x_1 + 52x_2 + 13x_3 = 104$

$3x_1 + 8x_2 + 29x_3 = 71$

b) Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$, subject to the conditions. **[9]**

$u(0, t) = 0, u(1, t) = 0$

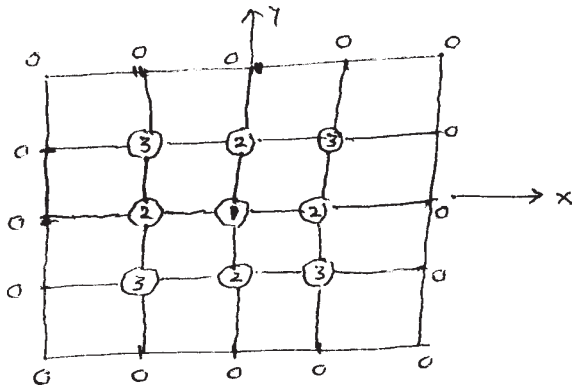
$u(x, 0) = 2x, 0 \le x \le \frac{1}{2}$

$= 2(1 - x), \frac{1}{2} \le x \le 1$

Taking $\delta x = 0.1$, $\delta t = 0.001$, find $u(x, t)$ at $t = 0.001, 0.002, 0.003$.

OR

Q6) a) Solve the equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=x^2y^2$ at the pivotal points of a grid shown in the figure below : **[8]**



b) Using method of least squares, fit a parabola of the form $y = ax^2 + bx + c$ to the following data : **[9]**

x	0	1	2	3	4	5	6
y	4	9	18	31	48	69	94

SECTION - II

Q7) a) Wages earned by workers A and B per day for a period of 10 days are as under : **[8]**

A	45	53	65	57	61	49	62	71	80	65
B	42	56	65	59	62	45	58	68	75	72

decide, who is better paid and who is more consistent in earnings.

b) The first four moments about the working mean 40 of a distribution are 0.5, 8, 42 and 500. Calculate the first four moments about the mean and find coefficients of skewness and kurtosis. **[8]**

OR

Q8) a) A can hit the target 2 out of 4 times. B can hit 1 out of 3 times and c can hit 3 out of 4 times. If they fire simultaneously. Find the probability that at least two score a hit. **[5]**

b) Find the lines of regression for the following data : **[7]**

x	15	20	24	18	27	19	21
y	18	22	23	15	25	16	24

c) Find correlation coefficient between x and y, given that $n = 25$, $\Sigma x = 75$, $\Sigma y = 100$, $\Sigma x^2 = 250$, $\Sigma y^2 = 500$, $\Sigma xy = 325$. **[4]**

Q9) a) A Coin is tossed 10 times, find the probability of getting exactly 7 heads and 7 or more heads. **[5]**

b) A manufacturer of cotter pins knows that 2% of his product is defective. If he sells cotter pins in boxes of 100 pins and guarantees that not more than 5 pins will be defective in a box, find the approximate probability that a box will fail to meet the guaranteed quality. **[6]**

c) Assuming that the diameters of 1000 brass plugs taken consecutively from machine form a normal distribution with mean 0.7515cm. and standard deviation 0.0020cm. How many of the plugs are likely to be rejected if the acceptable diameter is 0.752 ± 0.004cm.?
[z = 2.25, A = 0.488, z = 1.75, A = 0.4599]. **[6]**

OR

Q10) a) The table below gives number of books issued from a certain library on the various days of a week. **[6]**

Days	Mon	Wed	Thr	Fri	Sat	Sun
No. of books issued	120	130	110	115	135	110

Test at 5% l.o.s. whether issuing the book is day dependent $\left[\psi^{z}_{5,\,0.05}=11.07\right]$.

b) Fit a Poisson distribution to the following frequency distribution and compare the theoritical frequencies with observed frequencies. **[6]**

x	0	1	2	3	4	5
f	158	160	60	25	10	2

c) Find the unique fixed probability vector $\bar{t}$ of the following regular stochastic matrix. **[5]**

$$\overline{P}=\begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$$

Q11) a) Show that the sum of two tensors of the same order and type is another tensor of the same order and type. **[6]**

b) Show that the velocity of a fluid at any point is a contravariant tensor of rank one. **[5]**

c) A covariant tensor has components xy, y^2 in rectangular coordinates. Find its covariant components in polar coordinates. **[6]**

OR

Q12) a) Prove that the contraction of the tensor $\underset{q}{A}^{P}$ is an invariant. **[5]**

b) Find the components of the metric tensor in spherical and cylindrical coordinate systems. **[6]**

c) Prove that $\dfrac{\partial g^{ij}}{\partial x^{k}}=-g^{jl}\left\{ {i \atop lk} \right\}-g^{im}\left\{ {j \atop mk} \right\}$. **[6]**

Total No. of Questions : 12]

SEAT No.:

P1509

[Total No. of Pages : 3

[4163]-124
T.E. (Computer Engineering)
DIGITAL SIGNAL PROCESSING
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from Section - I and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in brief the sampling process in ADC. What is aliasing? **[8]**

b) Obtain linear convolution of two DT signals -

$x(n) = \{1, 0, 0, -2\}$
$\uparrow$

$h(n) = \{-1, 0, -2, 2\}$
$\uparrow$

state the properties of convolution. **[10]**

OR

Q2) a) State the advantages of DSP. Define the step and Impulse Response of a DT system. **[8]**

b) With example explain following operations performed on DT signal -

i) reflection/folding.
ii) time delaying.
iii) amplitude scaling. **[10]**

Q3) a) Obtain Z - Transform (ZT) of two standard signals $\delta(n)$ and $u(n)$. Specify the ROC. **[8]**

b) State and prove, following properties of Fourier Transform (FT) - **[8]**

i) Periodicity.
ii) Time Reversal.

P.T.O.

OR

Q4) a) Obtain IZT using PFE method for - **[8]**

$$X(z)=\frac{3z^2+2z+1}{z^2-3z+2}$$

b) Use ZT properties to obtain ZT of a signal - **[8]**

$x(n) = (n + 1)\, u(-n)$

specify the ROC.

Q5) a) State and define the following systems - **[8]**

i) All pole system.
ii) All zero system.
iii) Pole-zero system.

b) Define system function H (z). Obtain the Impulse Response for - **[8]**

$y(n) = x(n) - \frac{1}{2}\, y(n-1)$ using ZT.

OR

Q6) a) Use simple Geometric construction method to plot the magnitude response for a system - **[8]**

$$y(n) = \frac{1}{2}\,[x(n) + x(n-1)]$$

b) Determine system function H (z) and obtain the impluse response for - **[8]**

$$y(n) = x(n) - x(n-1) - \frac{1}{2}\, y(n-1).$$

SECTION - II

Q7) a) Derive the first stage of Decimation In Time (DIT) FFT algorithm. Draw the signal flow graph for N = 8. **[10]**

b) Obtain 4-point DFT using linear transformation matrix for a DT signal - **[8]**

$x(n) = \{1, 2, 3, 4\}$
$\uparrow$

OR

Q8) a) Compare between DFT and FT. State any four properties of DFT. **[10]**

b) Obtain 4 - point circular convolution using graphical method - **[8]**

$x(n) = \{1, -2, 2\}$
$\uparrow$
$h(n) = \{2, 0, 1\}$
$\uparrow$

Q9) a) Compare FIR filters with IIR filters. What do you mean by linear phase response? **[8]**

b) Explain how FIR filters can be designed using window method. **[8]**

OR

Q10) a) Explain Impulse Invariance method for IIR filter design. State its problems. **[8]**

b) What is frequency warping in BLT method? Write down the design steps for IIR filter using BLT method. **[8]**

Q11) a) Obtain the cascade form realization for IIR filter described as -

$$y(n) = x(n) + \frac{1}{3}\, x(n-1) + \frac{3}{4}\, y(n-1) - \frac{1}{8}\, y(n-2)$$

Draw the filter structure. **[8]**

b) Obtain the direct form and cascade form FIR filter structure having -

$h(n) = \{1, -3, 2\}$ **[8]**
$\uparrow$

OR

Q12) Draw the functional block diagram of ADSP21XY DSP processor. Explain the various functional blocks in detail. **[16]**

Total No. of Questions : 11]

SEAT No. : ____

P1673

[Total No. of Pages : 2

[4163] - 92

T.E. (Petroleum Engineering)

PETROLEUM GEOLOGY - I

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams should be drawn wherever necessary.***
3) ***Attempt any three questions from Section - I and Section - II.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Using a sketch, explain relative abundance of igneous, sedimentary and metamorphic rocks in terms of weight and volume proportion. **[8]**

b) Distinguish between conglomerate and breccia, residual and transported soil, oligomict and polymict conglomerate, clasts supported and matrix supported conglomerate. **[8]**

OR

Q2) a) Draw flowchart to explain various processes involved in the formation of sedimentary rocks. **[8]**

b) Explain the term 'Rock Cycle' with the help of a neat diagram. **[8]**

Q3) a) How hydrolysis and solution processes are responsible for decomposition of rocks? Explain with suitable examples. **[8]**

b) Discuss with the help of neat diagrams, different types of convergent plate boundaries. **[8]**

OR

Q4) a) Describe elastic rebound theory for earthquakes with the help of neat sketches. **[8]**

b) How is mass movement classified on the basis of moisture content and velocity? **[8]**

P.T.O

Q5) a) What is a fault? How faults are interpreted in the absence of any visible displacement? **[10]**

b) Explain flexure slip fold and shear slip fold with the help of suitable examples. **[8]**

OR

Q6) a) Describe classification of folds based on interlimb angle. How is the relationship of wavelength and amplitude useful in ascertaining the persistence and penetration of folds? **[10]**

b) Discuss in brief "Quantitative Description of Discontinuity". **[8]**

SECTION - II

Q7) a) What is a depositional sedimentary environment? Distinguish between environment of erosion, equilibrium and deposition. **[8]**

b) Draw a cross-sectional view of a sedimentary basin to show the relationship between facies, environment and time. **[8]**

OR

Q8) a) What are clay minerals? Distinguish between cohesive and in cohesive clay minerals. How are these recognized in the field? Discuss their signification in the sedimentary rocks. **[8]**

b) What are the digenetic changes taking place in sedimentary rocks with increasing depth and temperature? **[8]**

Q9) Write notes on <u>any two</u> of the following : **[16]**

a) Statistical representation of sedimentary rocks.

b) Trace fossils as an indicator of environment of deposition.

c) Use of microfossils in the exploration of hydrocarbons.

d) Dolomite and dolomitization.

e) Marine depth zones.

Q10)a) Write "Geological Time Scale" in a tabular form with important events in each era. **[10]**

b) What is a bedform? Explain in brief about generation of bedforms in relation to velocity of flow of water. **[8]**

OR

Q11)a) Explain transgression and Regression with the help of suitable diagrams. What is an onlap (Prograding) and offlap (Retrograding) sequence? **[12]**

b) Discuss in brief classification of Petroliferous basins in India as suggested by ONGC. **[6]**

Total No. of Questions : 12]

SEAT No. :

P1685

[Total No. of Pages : 3

[4163]-7

T.E. (Civil)

PROJECT MANAGEMENT AND COMPUTER APPLICATIONS

(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a short note on work breakdown structures. **[4]**

b) Draw the work breakdown structure for the construction of pile foundation. **[4]**

c) Draw the bar chart of above project. Assume suitable duration. **[6]**

d) Also draw the calender (based on bar chart). Consider 6 days working in one week Sunday as a holiday & 8 hours per day. **[4]**

OR

Q2) a) Give the definition of the following with example. **[12]**

i) Dummy Activity.
ii) Critical Path.
iii) Preceeding Activity.
iv) Succeeding Activity.

b) Show the following logic with the help of A-O-A network **[6]**

i) Activity C depends on A and B.
ii) Activity P depends on C and D but activity Q depends on C only.
iii) Activities M and N depends on Q, P and O.

Q3) a) Explain the following terms with examples. **[12]**

i) Direct cost of an activity.
ii) Crash cost of an activity.
iii) Normal cost of an activity.

b) What are the objectives of Resource Scheduling. **[4]**

OR

Q4) Draw the following network. **[16]**

Activity	Succeeded by	Duration (days)	Resources
A	C,D	3	4
B	E	2	6
C	G	1	3
D	E	6	6
E	F, H	4	6
F	G	5	8
G	I,J	3	5
H	K	8	5
I	L	5	4
J	M	6	2
K	M	9	1
L	-	3	2
M	-	3	2

a) Find the critical path and duration.

b) Carry out Resource levelling.

Q5) a) What are the qualities required for project manager. **[6]**

b) Explain the arbitration concept. What are the steps carried out in arbitration. **[6]**

c) Explain condition of contract. **[4]**

OR

Q6) a) What are the importance of material management. **[6]**

b) Explain the various activities carried out under the stores department. **[4]**

c) Explain how the following materials are stored on the construction site. Cement, Aggregates, Steel, Bricks. **[6]**

SECTION - II

Q7) a) What is the importance of safety in a construction project? Explain the safety measures to be adopted during the work of excavation. **[6]**

b) How will you ensure quality control in construction project? **[6]**

c) Draw the site layout for a proposed National Highway. **[6]**

OR

Q8) a) What are the fire safety measures to be adopted on a construction site. **[6]**

b) What are the various factors to be considered while selecting a good site layout. **[6]**

c) Enlist the various personal protective devices used on a building construction site. Prepare a Safety Programme for a construction firm. **[6]**

Q9) a) Define Economics. State its importance from Civil Engineering point of view. **[8]**

b) Explain the term Utility. With the help of example, state the law of Diminishing Marginal Utility. **[8]**

OR

Q10) a) State the Demand and Supply curve with the help of an example. **[8]**

b) What are the types of Demands? Explain them in short. **[8]**

Q11) a) State the importance of project documentation in construction project. State the applications of : **[8]**

i) Material Indent Register.
ii) Drawing Register.

b) Show a typical format of any one of the above. **[8]**

OR

Q12) a) Explain the application of Data Base Management to materials management. **[8]**

b) What is Quality control? State its importance in construction project. Discuss quality control norms for any two construction materials. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1691

[Total No. of Pages : 3

[4163]-34

T.E. (Production)

PRODUCTION PLANNING AND CONTROL

(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answers will be valued as a whole.***
7) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
8) ***Assume suitable data if necessary.***

SECTION - I

Unit - I

Q1) a) What is production planning? Explain the levels of production planning and factors which determine the production planning. **[8]**

b) Explain the integrated approach towards PPC. **[8]**

OR

Q2) a) Explain briefly the relationship of Production Planning and Control (PPC) department with other departments in the organisation. **[8]**

b) What are the different types of production systems? Explain any two in detail. **[8]**

Unit - II

Q3) a) Explain various factors which affect sales forecasting. **[9]**

b) The following table contains actual sales of a particular product for 6 weeks and forecast of 1st week is given.

Week	1	2	3	4	5	6
Actual Demand	60	64	58	57	65	63
Forecast	55					

P.T.O.

i) Calculate forecast for the remaining five months using single exponential smoothing with $\alpha = 0.3$. **[5]**

ii) Calculate MAD (Mean Absolute Deviation) and MAPE for the forecast (MAPE – Mean Absolute Percentage Error). **[4]**

OR

Q4) a) Explain with figures various demand patterns used in sales forecasting. **[9]**

b) The following table gives the demand for 8 months.

Month	1	2	3	4	5	6	7	8
Demand	200	210	184	256	190	202	160	166

i) Calculate the demand for 9^{th} month using simple Moving Average Method for the moving average period of 3 months. **[6]**

ii) Calculate MFE (Mean Forecast Error). **[3]**

Unit - III

Q5) a) Draw a route sheet/process sheet for any component manufactured at your workshop. Assume, component drawing dimensions and sequence of operations. **[8]**

b) Find the sequence that minimises the time required to perform the following jobs on three machines in the order A-B-C (Time in hours). **[8]**

Job →	1	2	3	4	5	6
Machine A	12	7	9	7	9	5
Machine B	7	8	10	7	5	10
Machine C	12	12	12	13	14	13

Also find the total elasped time.

OR

Q6) a) Explain the priority sequencing rules used in solving sequencing problems. **[8]**

b) What are the factors affecting process planning? Also explain information required for process planning. **[8]**

SECTION - II

Unit - IV

Q7) a) Explain MRP-I, with its input, output & merits. **[8]**

b) Explain in brief what is ERP? What are the benefits to the ERP user if implemented. **[8]**

OR

Q8) a) Explain with block diagram flow of information in CRP. **[8]**

b) Explain 'Make or Buy Decisions' with its different aspects. **[8]**

Unit - V

Q9) a) What is inventory? Explain why do we have inventories? **[9]**

b) Annual demand for an auto component is 60000 units. The carrying cost is Rs. 6.00/unit/year, the ordering cost is Rs. 60.00 per order and shortage cost is Rs. 20.00/unit/year. Find:

i) Order quantity. **[2]**

ii) Cycle time. **[2]**

iii) Maximum level. **[2]**

iv) Represent the system graphically. **[3]**

OR

Q10) a) What are the different costs associated with inventory? Explain in brief. **[9]**

b) A materials manager adopts the policy to replace an order for minimum quantity of 1800 of a particular product in order to avail discount of 18%. It was found from the company record that for last 5 orders were placed each size 400 Nos, ordering cost is Rs. 240 per order. Inventory carrying charges at Rs. 18% and cost per unit is Rs. 300/-. Is the purchase manager justified in his decision? What is the effect of this decision on the company. **[9]**

Unit - VI

Q11) a) What are the different forms and records used in purchase department. Explain what are different terms and conditions to be mentioned in the purchase order. **[8]**

b) Why industry has to go for stock taking? Explain in brief different methods of stock taking (verification)? **[8]**

OR

Q12) a) With the block diagram explain working of UIT system. **[8]**

b) Differentiate between centralized and decentralized stores location. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1699

[Total No. of Pages : 2

[4163]-100
T.E. (Petroleum)
DESIGN OF PETROLEUM MACHINERY
(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Question nos. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss different types of couplings. **[10]**

b) Discuss different types of clutches. **[8]**

Q2) Write short notes on any four : **[16]**

a) Selection of Pumps.

b) Use of Standards and codes in design.

c) Factor of safety.

d) Stress concentration.

e) Brakes in draw-works.

Q3) a) What are different types of compressors? Discuss reciprocating compressor in detail. **[8]**

b) Write mechanical properties of engineering materials. And discuss criterion for selection of materials. **[8]**

Q4) a) What type of pumps are used at petroleum production facilities? State and explain the equations used to determine the horsepower capacity of any two types of pumps. **[8]**

b) Explain mud circulation system. **[8]**

P.T.O.

SECTION - II

Q5) Write short notes on : **[18]**

a) Heat exchanger.

b) Storage tank.

c) Agitator.

Q6) a) Discuss design factors considered for pressure vessel. **[8]**

b) What are different types of separators? Explain any two. **[8]**

Q7) a) Write a note on TEMA codes of heat exchangers. **[8]**

b) Explain shell and tube heat exchanger in detail. **[8]**

Q8) a) Write the function of baffles and tie rods. **[8]**

b) Discuss different types of welded joints. **[8]**

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Total No. of Questions : 8]

SEAT No.:

P1758

[Total No. of Pages : 2

[4163]-101
T.E. (Petrochemical Engineering)
CHEMICAL PROCESS INDUSTRIES
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe with flowsheet the ammonium carbamate decomposition process for manufacture of urea. **[12]**

b) Mention major engineering problems in production of lime. **[6]**

Q2) a) Describe with flowsheet the ammonia oxidation process for manufacture of nitric acid. **[12]**

b) Mention end uses of glycerine and ethanol. **[4]**

Q3) a) Describe with flowsheet the bergius process for manufacture of aromatic liquids from coal. **[12]**

b) Write a note on dyes and their classification. **[4]**

Q4) a) Describe with flowsheet the contact process for manufacture of sulphuric acid. **[12]**

b) Write a note on carbohydrates and their applications. **[4]**

SECTION - II

Q5) a) Describe with flowsheet the extraction process for manufacture of crystal sugar. **[12]**

b) Mention end uses of caustic soda, sulphuric acid and nitric acid. **[6]**

P.T.O.

Q6) a) Describe with flowsheet the solvay process for manufacture of soda ash. **[12]**

b) Write a note on by-products of sugar industry. **[4]**

Q7) a) Describe with flowsheet the continuous hydrolysis and saponification process for manufacture of soap and glycerine. **[12]**

b) Mention major engineering problems in production of lime. **[4]**

Q8) a) Describe with flowsheet the Raschig-Olin process for manufacture of hydrazine. **[12]**

b) Describe the process for production of gur from sugarcane. **[4]**

Total No. of Questions : 8]

SEAT No. :

P1762

[Total No. of Pages : 2

[4163] - 109
T.E. (Petrochemical)
TRANSPORT PHENOMENA
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any 3 questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculators is allowed.***
4) ***Draw neat sketch wherever necessary.***

SECTION - I

Q1) a) Give the overview of Transport phenomena principles with respect to quantity, driving force, characterizing parameter and governing law for Momentum, heat and mass transfer respectively. **[9]**

b) Differentiate between : Laminar – Turbulent flow, Compressible - Incompressible flow, Viscid-Inviscid flow, Uniform-Nonuniform flow. **[9]**

Q2) a) Define Control Volume. What are the forces acting on a Control Volume. **[8]**

b) Derive Hagen-Poiseuille's equation and state its applications. **[8]**

Q3) a) Explain with neat diagram the development of turbulent boundary layer. **[8]**

b) Explain with significance the Prandtl's Mixing Length theory. **[8]**

Q4) a) Explain Various Mixing problems in process industry. **[8]**

b) Derive power number for a agitated vessel. **[8]**

P.T.O

SECTION - II

Q5) a) Write a short note on heat transfers in Agitated Vessels. **[10]**

b) Derive the expression for the time required for a batch heating with a non-isothermal heating medium. **[6]**

Q6) a) Derive an approximate method from Reynolds Analogy for momentum, heat and mass transfer for evaluating mass transfer coefficient if heat transfer coefficient is known. **[8]**

b) Air at 330 K, flowing at 10 m/s, enters a pipe of inner diameter 25 mm, maintained at 415 K. The drop of static pressure along the pipe is 80 N/m^2 per meter length. Using the Reynolds analogy between heat transfer and fluid friction, estimate the air temperature 0.6 m along the pipe. **[8]**

Q7) a) What is Computational Flow Modeling? Explain in detail what are the steps involved in a typical flow-modeling project. **[10]**

b) Explain the basic elements in mapping a computational flow model onto a CFD tool. **[8]**

Q8) Write a short note on any four of the following: **[16]**

a) Dimensionless numbers in Chemical engineering.

b) Classification of Partial Differential Equations.

c) Advantages and Limitations of CFD.

d) Static Mixers.

e) Phase coupling in multiphase systems.

Total No. of Questions : 8]

P1772

SEAT No.:

[Total No. of Pages : 4

[4163]-3
T.E. (Civil)
STRUCTURAL DESIGN AND DRAWING - I
(2003 Pattern) (Sem. - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer Que. 1 or Q. 2, Que. 3 or Q. 4 from section-I and Que. 5 or Que. 6, Que. 7 or Que. 8 from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat sketches must be drawn wherever necessary.***
4) ***Use of I.S. 800, I.S. 875 and Electronic Pocket Calculator is allowed.***
5) ***Use of steel table is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) An unequal Angle Section 100 × 75 × 8 mm @ 10.5 kg/m. carries tensile load of 200 kN applied along centroidal axis. It's C.G. is at 31.0 mm from it's heel. Find the length of side fillet weld required if permissible stress in weld is 100 N/mm^2. **[8]**

b) Design a tension member consisting of two equal Angles connected on same side of Gusset plate 10 mm thick with 20 mm rivets. It carries tensile load of 275 kN. Take fy = 250 N/mm^2. **[8]**

c) Design a double cover butt joint for connecting two plates 275 × 10 mm thick. The plates are carrying tensile load of 400 kN. Use HSFG bolts 20 mm diameter 10 k bolts are available. The proof load for bolt is 171.5 kN. **[9]**

OR

Q2) a) An interior column of building carries an axil load of 750 kN. The length of column is 4.25 m. The column is fixed at one end and hinged at the other. Design the column if fy = 250 N/mm^2. **[8]**

b) A double bolted double cover butt joint is used for connecting plates 10 mm thick. The diameter of bolt is 20 mm suggest a suitable pitch of bolt also find efficiency of joint. If proof load for 20 mm bolt is 168.2 kN, μ = 0.45 and f.s. = 1. Take fy = 250 N/mm^2. **[8]**

P.T.O.

c) Find the maximum size of fillet weld required to connect the bracket plate to the column as shown in fig.2(c) stress in weld not to exceed 100 N/mm^2. **[9]**

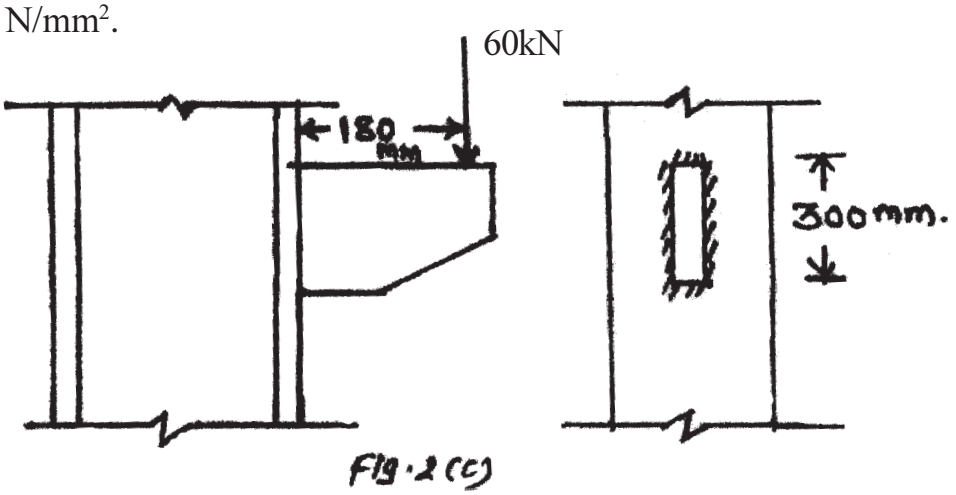

Fig. 2 (c)

Q3) a) An office floor is 9 m × 5 m with R.C.C. slab 150 mm thick over steel joist placed at 3 m centre. Design the joist. The L.L. on slab is 3 kN/m^2 the safe stresses for joist in bending and shear may be taken as 165 N/mm^2 and 100 N/mm^2 respectively. **[9]**

b) Design a welded plate girder having simply supported span of 20 m. It carries U.D.L. 100 kN/m and two concentrated loads of 100 kN each at 4 m. from either ends. The depth of girder is restricted to 1500 mm. Design a suitable cross section.

i) Design for flexture and shear.
ii) Design intermediate vertical stiffner.
iii) Design of all welded connection. **[16]**

OR

Q4) Design a simply supported Gantry girder to carry electric overhead traveling crane for the following data. Sections designed should be safe for maximum bending moment due to vertical forces, lateral forces and longitudinal forces.

a) Crane capacity = 200 kN. **[25]**
b) Weight of crane excluding trolly = 150 kN.
c) Weight of trolly = 100 kN.
d) Minimum approach of crane hooks = 1.2 m.
e) Distance between centre of crane wheels = 3 m.
f) Distance between centre of gantry girders = 18 m.
g) Longitudinal spacing of columns = 6.5 m.
h) Weight of rail section = 0.3 kN/m.
i) Height of rail section = 75 mm.

SECTION - II

Q5) a) A foot over bridge as shown in fig.5 (a) provided with R.C.C. slab for flooring of thickness 125 mm. if unit weight of concrete is 25 kN/m^3 and L.L. due to pedestrian is 5 kN/m^2.

Design

i) A cross beam.

ii) Design member U_1L_2, U_2L_2, U_2U_3

iii) Draw neat plan and elevation do not design connections take fy = 250 N/mm^2. **[15]**

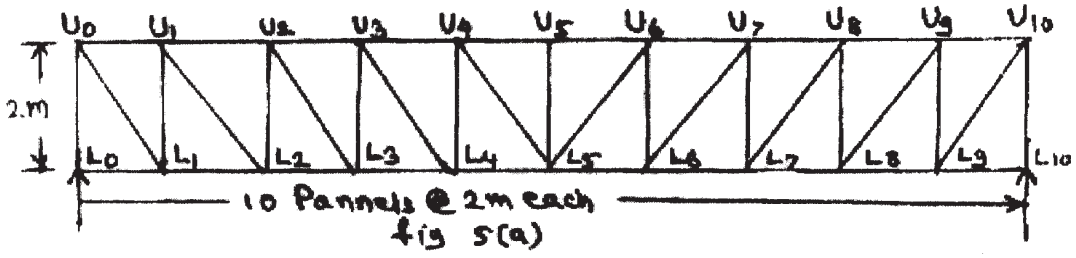

fig 5(a)

b) Design an Angle Purlin to support C.G.I. sheets roof. The purlins are spaced at 1.6 m apart and trusses are spaced at 5.0 m c/c. Assume self wt. of sheets 130 N/m^2 and wind load normal to roof 1500 N/m^2 and pitch of roof 26.56°. **[10]**

OR

Q6) a) A N-type foot over bridge is as shown in fig. 6 (a) subjected to equivalent D.L. of 2 kN/m and L.L. of 10 kN/m including self weight. Find : **[10]**

i) Forces in member U_2L_3, U_3U_4, U_3L_3.

ii) Design the racker.

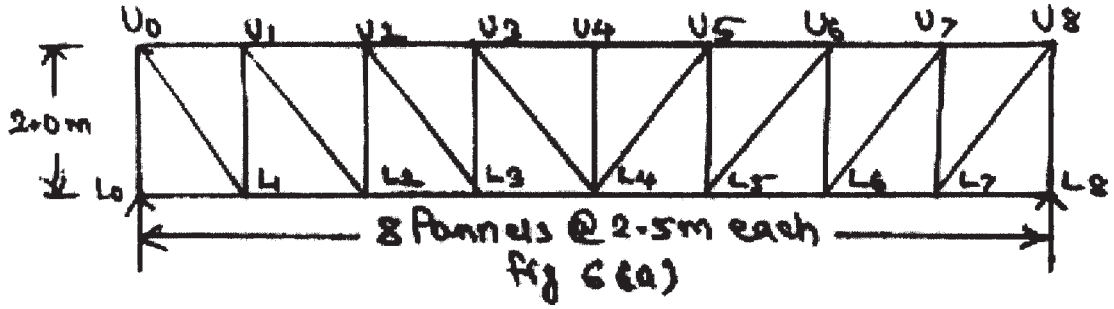

fig 6(a)

b) A Roof truss has following details as shown in fig. 6(b). (1) Type of truss - fink, (2) Span of truss - 16 m, (3) Rise of truss = 3.2 m., (4) Spacing of truss = 4.5 m., (5) Roofing - G.I. sheets. Calculate panel point D.L., L.L. and wind load assuming basic wind velocity 39 m/s, $K_1 = 1.0$, $K_2 = 0.98$, $K_3 = 1.0$, $C_{pe} = 0.7$, $C_{pi} = \pm\ 0.5$. **[15]**

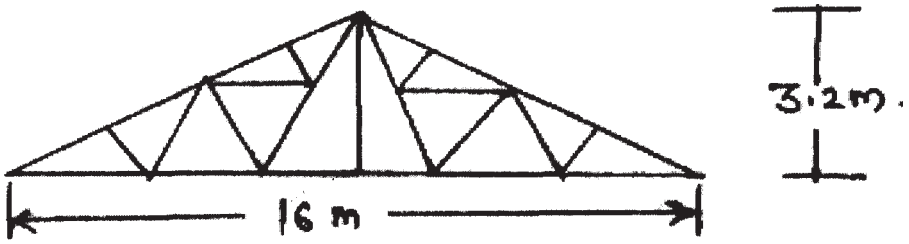

Fig. 6 (b)

Q7) a) A column 6m. effective length has to support Axil load of 1000 kN. Design the column using two channels placed back to back at suitable spacing design the lacing system for the same take fy = 250 N/mm^2. **[15]**

b) Explain : **[10]**

i) Stiffened element,
ii) Multiple stiffened element,
iii) Flat width ratio,
iv) Types of light gauge sections.

OR

Q8) a) Design a slab base footing for a column ISHB 400 carrying Axil load of 1500 kN. The permissible stress in concrete in compression is 4 N/mm^2. **[10]**

b) Design an Gussetted base for a column ISHB 250 @ 54.7 kg/m with cover plates 300 mm × 12 mm used as a column for supporting Axil load of 1600 kN. Assuming bearing pressure of concrete 4 N/mm^2, S.B.C. of soil 200 kN/m^2. **[10]**

c) Explain advantages of cold form sections over Hot Rolled Sections. **[5]**

Total No. of Questions : 12]

SEAT No. :

P1789

[Total No. of Pages : 3

[4163]-1
T.E. (Civil)
THEORY OF STRUCTURES - II
(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve Que 1 or Que 2, Que 3 or Que 4, Que 5 or Que 6 from Section - I. Que 7 or Que 8, Que 9 or Que 10, Que 11 or Que 12 from Section - II.***
2) ***Answer any 3 questions from each section.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answers will be valued as a whole.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Using **Slope Deflection Method**, analyses the frame loaded and supported as shown in **Fig. 1**. Hence plot BMD and SFD. Assume constant EI for all members. **[18]**

OR

Q2) Analyze the frame loaded and supported as shown in **Fig. 2** using **Moment Distribution Method** and hence draw BMD. Assume constant EI for all members. **[18]**

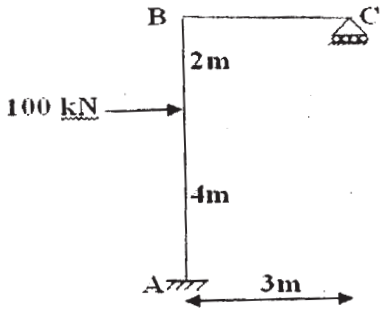

Fig 1

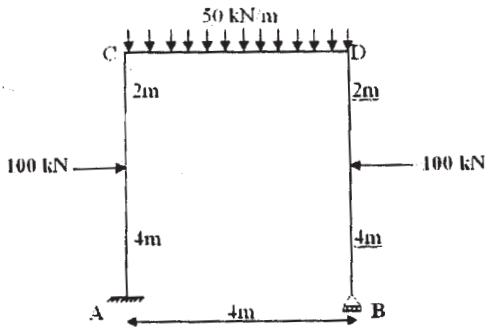

Fig 2

Q3) a) State any four points of comparison between flexibility and stiffness matrix methods. **[4]**

b) Derive the equilibrium equations in matrix form for the frame loaded and supported as shown in **Fig. 2** using **stiffness matrix method**. **[12]**

P.T.O.

OR

Q4) Using **Flexibility Matrix Method**, analyze the truss loaded and supported shown in **Fig. 3**. Determine the forces in the members. **[16]**

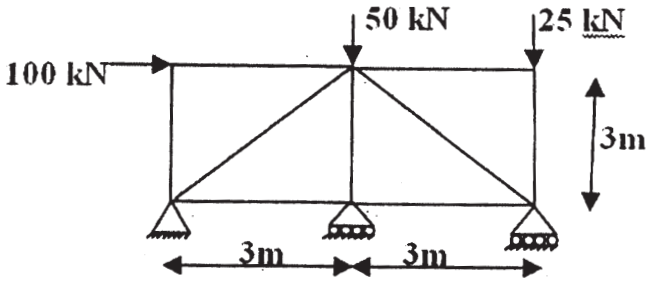

Fig 3

Q5) a) State the assumptions in portal method of approximate analysis. **[3]**

b) Using **Cantilever method of approximate analysis**, determine reactions and moments at all support of plane frame shown in the **Fig. 4**. Assume Area of column ABCD, EFGH and IJKL is A, 2A and 3A respectively. Hence draw SFD, AFD and BMD for column ABCD and beam DHL. **[13]**

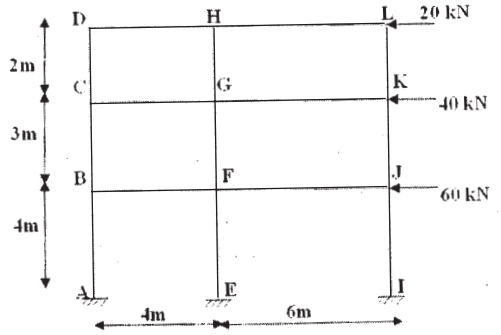

Fig 4

OR

Q6) For a semicircular beam of radius, R supported at three equidistant supports and loaded with uniformly distributed load, 'w' per meter length. Prove that the maximum moment at central support is $-0.429\ wR^2$ and maximum twisting moment is equal to 0.0103 times wR^2. **[16]**

SECTION - II

Q7) a) State and explain Saint Venants principle. Write Connectivity matrices relating stress to strain and strain to stress, in three dimensions. **[9]**

b) An elastic body under the action of external has the displacement field given by $D = (2x^2 + y^2)\ i + (5z - y)\ j + (3x + y^2)\ k.$ **[9]**

Evaluate the components of strain at point (3, 1, 2).

OR

Q8) a) Derive the Beam-Column differential equation in stability analysis. **[6]**

b) Explain Lateral instability of beam with example. **[6]**

c) Explain the utility of south well plot. **[6]**

Q9) a) Determine the Shape factor for solid equilateral triangle section of side, L. **[8]**

b) Derive the expressions for length of cable with dip, h, span, L and udl w per meter run. **[8]**

OR

Q10) a) Define shape factor, plastic hinge, upper bound and lower bound theorem. **[8]**

b) A uniform cable of self weight w/m run connects two points which are at the same level. Treating the central dip (h) as small as compared to span (L), prove that the difference between maximum and minimum tension in the cable is 'wh'. **[8]**

Q11) a) Using finite difference method, determine the displacement at the quarter span of simple supported beam AB of span 4 m subjected to central point load of 100 kN. Assume 1 m interval and constant EI for beam AB. **[8]**

b) Explain following : **[8]**

i) Development of finite element method.
ii) Pascal's triangle.
iii) Shape functions.

OR

Q12) a) Using finite difference method, determine the displacement at the end of cantilever beam AB of span 4 m subjected to central point load of 100 kN. Assume 1 m interval and constant EI. **[8]**

b) State the following : **[8]**

i) Principal of virtual work.
ii) Typical finite elements.
iii) Convergence requirement for displacement function.

✷ ✷ ✷

Total No. of Questions : 12] **SEAT No. :**

P1807 **[Total No. of Pages : 4**

[4163] - 58

T.E. (Electronics/E & TC)

DIGITAL SIGNAL PROCESSING

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A causal system TS described by equation $y[n] + y[n-1] - 2y[n-2] = x[n] + 2x[n-2]$ **[10]**

i) Determine its system function.
ii) Determine its impulse response.
iii) Determine its unit step response.
iv) Determine if system is stable.

b) Determine all possible signals $x[n]$ associated with **[8]**

$$X[z] = \frac{1}{1 - \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2}}$$

OR

Q2) a) State and prove time reversal property of z transform. **[4]**

b) Find convolution of two sequences. **[8]**

i) $x[n] = \left(\frac{1}{2}\right)^n u[n]$ $\quad h[n] = u[n] - u[n-10]$.

ii) $x[n] = \left(\frac{1}{3}\right)^{-n} u[-n-1]$ $\quad h[n] = u[n-1]$.

c) A causal system TS described by equation.

$$y[n] + \frac{1}{4}\, y[n-1] = x[n] + \frac{1}{2}\, x[n-1]$$

Find system function H[z] and ROC. Also find unit sample response $h[n]$ **[6]**

P.T.O.

Q3) a) State and prove following properties of DFT **[8]**

i) Circular frequency shift.

ii) Circular Convolution.

b) Given $x\,[n] = 2^n$ and N = 8 find $X\,[k]$ using DIT FFT algorithm. **[8]**

OR

Q4) a) Use overlap add method to find step response of a filter with $h\,[n] = 2^{-n}$ [u[n] – u [n –3]] and L = 3. **[8]**

b) Compute 8 point DFT of following sequence using DIF - FFT algorithm. **[8]**

$$x\,[n] = n \qquad 0 \le n \le 7$$
$$= 0 \qquad \text{otherwise}$$

Q5) a) A low pass filter has desired response

$$H_d\,(e^{Jw}) = e^{-3Jw} \qquad 0 \le w \le \pi/2$$
$$= 0 \qquad \frac{\pi}{2} < w \le \pi$$

Determine filter coefficients $h\,[n]$ for m = 7 using frequency sampling technique. **[8]**

b) Realize following system functions in canonical form. **[8]**

i) $$H[z] = \frac{1 - z^{-3}}{\left(1 - \frac{1}{4}z^{-1}\right)\left(1 - z^{-1} + \frac{1}{2}z^{-2}\right)}$$

ii) $$H\,[z] = \frac{1 + \frac{1}{4}z^{-1}}{\left(1 + \frac{1}{2}z^{-1}\right)\left(1 + \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2}\right)}$$

OR

Q6) a) Write short notes on **[8]**

i) Gibbs Phenomenon.

ii) FIR differentiator.

b) Design an ideal HPF with frequency response

$$H_d\,(e^{Jw}) = 1 \qquad \frac{\pi}{4} \le w \le \pi$$
$$= 0 \qquad |w| < \pi/4$$

Find $h\,[n]$ for N = 7 using Hanning window. **[8]**

SECTION - II

Q7) a) Design digital Butterworth filter using BLT with specifications. **[12]**

$0.9 \leq |H(e^{Jw})| \leq 1 \qquad 0 \leq w \leq \frac{\pi}{2}$

$|H(e^{Jw})| \leq 0.2 \qquad \frac{3\pi}{4} \leq w \leq \pi$

Assume T = 0.1 seconds.

b) Convert following analog filter into digital by means of impulse invariance method. **[6]**

$$Ha(s) = \frac{1}{(s+1)(s+2)}$$

OR

Q8) a) Differentiate the following IIR filter design techniques:

i) Impulse invariance technique.

ii) Bilinear transformation technique. **[8]**

b) Design Chebyshev LPF for specifications. **[10]**

α_p = 1 dB for $0 \leq w \leq 0.2\pi$

α_s = 15 dB for $0.3\pi \leq w \leq \pi$

Use impulse invariance technique.

Q9) a) Define

i) Decimation ii) Interpolation. **[4]**

b) Design 2 stage decimator for specifications. **[12]**

Sampling rate of input signal = 20 KHz

M = 100 pass band = 0 to 40 Hz

Transition band = 40 to 50 Hz

Pass band ripple = 0.01 stop band ripple = 0.02.

OR

Q10)a) With the help of neat diagram explain the sub-band coding of audio signals. **[4]**

b) Implement multirate LPF for specifications. **[12]**

Pass band 0 to 0.4 Hz

Stop band 0.5 to 250 Hz

$\delta_p = 0.01$ $\delta_s = 0.001$ $F_s = 500$ Hz.

Q11)a) Draw block diagram of oversampling ADC. Explain the applications of oversampling A/D, D/A converters. **[8]**

b) What TS dynamic range scaling. **[4]**

c) List sources of errors in DSP. How product round off errors are minimized. **[4]**

OR

Q12)a) Draw architectural block diagram of DSP processor and explain each block in detail. **[8]**

b) Consider second order IIR filter with

$$H(z) = \frac{1}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{4}z^{-1}\right)}$$

Find the effect of quantization on pole locations of the given system function in direct form and in cascade form. Take b = 3 bits. **[8]**

Total No. of Questions : 6]

SEAT No. :

P969

[Total No. of Pages : 2

[4163] - 20
T.E. (Mechanical)
Metrology and Quality Control
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Design and make drawing of general purpose 'Go' and NOGO plug gauge for inspecting a hole of 40 ± 0.04. Assume Gauge makers tolerance equal to 10% and wear tolerance equal to 10%. **[10]**

b) Explain Taylors principle. **[6]**

OR

a) Differentiate between line and end standards. **[8]**

b) Define straightness, flatness, squareness and roundness. **[8]**

Q2) a) Explain working principle with applications of Johnson's microkater. **[8]**

b) Explain N.P.L. flatness Interferometer **[8]**

OR

a) Derive Relation for best wire size. Calculate the diameter of best size and the difference between size under wires and effective diameter. **[8]**

b) Explain working principle with neat sketch of floating Carrage Micrometer. **[8]**

Q3) Write short notes (Any Three): **[18]**

a) Alignment Test on Milling machine.

b) Span micrometer.

c) Co-ordinate Measuring Machine.

d) David Brown tangent Comparator.

P.T.O

SECTION - II

Q4) a) Difference between Quality Control, Quality Assurance and Inspection. **[10]**

b) Differentiate between Quality Design and Quality Conformance. **[6]**

OR

a) Compare the variable chart and attribute chart. **[8]**

b) The No. of defects found in each sample of cloth of 1sq.mm. area are noted down as follows. Draw appropriate control chart and check the process is in control or not. **[8]**

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
No. of defects found	8	9	5	8	5	9	9	11	8	7	6	4

Q5) a) Explain the characteristics of O.C. Curve. **[8]**

b) Calculate the sample size and AOQ for Single Sampling Plan. **[8]**

i) Probability of acceptance for 0.4 % is 0.558.

ii) Lot size N = 10,000 units.

iii) Acceptance number C = 1,

iv) np = 1.5

Defectives found in samples are not to be replaced.

OR

a) Compare the Single Sampling, Double Sampling and Multiple Sampling Plan. **[8]**

b) Compare the $\overline{X}$ chart, R-chart with P chart and C-chart. **[8]**

Q6) Write short notes (Any Three): **[18]**

a) DMAIC.

b) FMECA.

c) Quality Audit.

d) Quality circle.

Total No. of Questions : 10]

SEAT No. :

P971

[Total No. of Pages : 2

[4163] - 23
T.E. Mech. (Mechanical SandWich)
Behavioural Science
(2003 Pattern) (Elective - I) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the purpose of a Industrial enterprise. Discuss in detail factors influencing the governing of enterprise. **[8]**

b) Discuss advantage and disadvantage of a public limited company? **[8]**

Q2) a) Explain the main characteristics of Industrial Licensing, **[8]**

b) State and explain year 2011 Industrial policy in India. **[8]**

Q3) Define motivation. Explain in detail the following theories of motivation. **[16]**

a) Maslow's theory.

b) Herzberg's theory.

Q4) Write a short note on (Any Three): **[18]**

a) Functions of management.

b) Line and staff organisation.

c) Learning theories.

d) Trade Union.

Q5) Explain in detail:

a) Organisation structure. **[8]**

b) Classical and Neo classical theory. **[8]**

P.T.O

SECTION - II

Q6) a) What is formal group? State benefit & problem associated with it. **[8]**

b) Explain Transactional analysis. Give one example. **[8]**

Q7) a) Explain Theory X and Theory Y in detail with specific relevance. **[8]**

b) What is management of change? Explain in detail. **[8]**

Q8) a) What is upward communication? Give one example. **[8]**

b) What are different leadership models? Explain any one type. **[8]**

Q9) a) List communication methods. Explain non verbal communication. **[8]**

b) Explain 'Traits of effective leaders'. **[8]**

Q10) Write short notes on (Any Three): **[18]**

a) Downward Communication.

b) Leadership types.

c) Sources of conflicts.

d) Indirect interview Technique.

e) Learning theories.

Total No. of Questions : 12]

SEAT No. :

P972

[Total No. of Pages : 2

[4163]-31

T.E. (Production Engineering)

MATERIAL SCIENCE AND COMPOSITE MATERIALS

(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Draw ray diagram and explain working of each part of metallurgical microscope. **[10]**

b) Explain with microstructures, how properties of steel vary with %C. **[8]**

OR

Q2) a) Draw neat Fe-Fe_3C equilibrium diagram with all important phases and temperatures. **[10]**

b) Describe the steps used for specimen preparation during metallographic study. **[8]**

Q3) a) List out the important objectives of various heat treatments processes used for steels. **[8]**

b) What is hardenability? Explain with figure Jominy hardenability test. **[8]**

OR

Q4) a) Differentiate between : **[8]**

i) Annealing and Normalising.
ii) Hardening and Tempering.

b) What is retained austenite? Why it is not desirable? How it can be eliminated? **[8]**

Q5) a) Differentiate between nitriding and carburizing. **[8]**

b) Explain in brief Flame hardening and induction hardening. **[8]**

P.T.O.

OR

Q6) a) Differentiate between austempering and martempering. **[8]**

b) Explain in brief carbonitriding and carburizing. **[8]**

SECTION - II

Q7) a) List out various alloying elements with their effect on properties of alloy steels. **[10]**

b) Explain in brief types of stainless steels with their properties and applications. **[8]**

OR

Q8) a) Draw microstructures of various cast irons. List out the properties and applications of each cast iron. **[10]**

b) Describe various heat treatments for cast irons. **[8]**

Q9) Give typical composition, properties and applications of the following: **[16]**

a) Monel.

b) Phosphor Bronze.

c) Hastelloy.

d) Gun metal.

OR

Q10) a) Give the reason for : **[8]**

i) Bearing material must be heterogeneous.

ii) Alpha brasses can be cold worked.

b) List out aluminium alloys with their properties. Also suggest their applications. **[8]**

Q11) a) What are the unique properties composites have over the conventional materials? **[8]**

b) Write short note on : **[8]**

i) Nanomaterials and their applications.

ii) Biomaterials.

OR

Q12) a) Describe in brief various types of composites with their typical applications. **[8]**

b) Explain with sketch how boron and carbon fibers are produced. **[8]**

✷ ✷ ✷

Total No. of Questions : 12]

SEAT No.:

P973

[Total No. of Pages : 5

[4163]-32
T.E. (Production Engineering)
KINEMATICS AND DESIGN OF MANUFACTURING MACHINES
(Common to Production S/W) (2003 Pattern) (Sem. - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain shaping machine and kinematic analysis of various members of the machine. **[8]**

b) Explain E-22, C-14 structures with suitable examples and comment on their selection. **[8]**

OR

Q2) a) Discuss type synthesis, number synthesis and dimensional synthesis. **[6]**

b) Design a four bar mechanism by using three precision points to generate $y = x^{1.5}$ for the range $1 \leq x \leq 4$. Assume $\theta_s = 30°$, $\Delta^{\theta} = 90°$, $\phi_s = 90°$, $\Delta\phi = 90°$. Take length of the fixed link as 50mm. **[10]**

Q3) a) Explain various factors influencing the fatigue strength of components. **[8]**

b) A transmission shaft made of cold drawn steel (sut = 630N/mm^2 and syt = 360N/mm^2) is subjected to a fluctuating torque which varies from 600Nm clockwise and 400Nm clockwise. The surface finish factor and size factor are 0.8 and 0.85 respectively. The reliability factor is 0.897. If factor of safety is 2. Determine diameter of shaft. Use maximum shearstress theory of failure. **[8]**

OR

Q4) a) Explain modified goodman diagram for fluctuating bending stresses. **[8]**

P.T.O.

b) A cantilever beam of circular cross section is fixed at one end and subjected to completely reversed force of 10kN at free end. The force is perpendicular to axis of beam. The distance between free and fixed ends is 100 mm. The beam is made of steel with ultimate tensile strength of 540N/mm^2 and tensile yield strength of 320N/mm^2. The construction of cantilever is such that there is no stress concentration. The size factor, surface finish factor and reliability factor are 0.85, 0.8 and 0.868. The temperature factor is 1.010. If diameter of beam is 35mm determine life of beam. **[8]**

Q5) a) Explain with neat sketch the nomenclature of helical gear. **[6]**

b) A pair of spur gears with 20° full depth involate consists of 18 teeth pinion meshing with 40 teeth gear. The module is 4mm while the face width is 40mm. The permissible bending stress for steel gear pair is 150 N/mm^2. The gears are machined to meet the specifications of grade 8 and heat treated to surface hardness of 300 BHN. The service factor and factor of safety are 1.75 and 2 respectively determine :

i) Optimum speed for max. power transmission.

ii) Max. power transmitted by gear pair at above speed.

Use following data :

For grade 8, e = 16 + 1.25 [m + 0.25 $\sqrt{d}$]

$$Fd = \frac{en_p z_p b r_p r_g}{2527\sqrt{r_p^2 + r_g^2}} \cos\phi$$

Lewis form factor Y = 0.484 – $\frac{2.87}{z}$

Notations have usual meaning. **[12]**

OR

Q6) a) What are different types of gear tooth failure. **[6]**

b) Following data is given for a pair of helical gears made of steel. **[12]**

Normal module = 5mm, face width = 50mm,

Number of pinion teeth = 30, Number of gear teeth = 60,

Centre distance = 245mm, Normal pressure angle = 20°,

Pinion speed = 1000 rpm, surface hardness = 300 BHN,

Factor of safety = 2.0, service factor = 1.5,

Grade of machining = 8,

Permissible bending stress for pinion and gear material = 150N/mm^2.

Determine :

i) helix angle.
ii) beam strength.
iii) wear strength.
iv) dynamic load by Spott's equation.
v) maximum static load the gears can transmit.
vi) power transmitting capacity.

for grade 8, $e = 16.0 + 1.25\ [m_n + 0.25\sqrt{d}\ ]$.

Spott's equation, $$Fd = \frac{e n_p z_p b r_p r_g}{2527\sqrt{r_p^2 + r_g^2}} \cos\phi_n \cos\psi$$

Lewis factor, $y' = 0.484 - \frac{2.87}{z'}$

Notations have usual meaning.

SECTION - II

Q7) a) Explain mounting of bearings with suitable diagram. **[6]**

b) A shaft with centrally mounted helical Pinion is supported by deep groove ball bearings at both ends. The centre distance between bearings 100mm. Shaft transmits 5kW power at 3000 rpm. The PCD of pinion 80mm. The normal pressure angle and helix angle are 20º and 19º respectively. The expected life of bearing 8000 hours with reliability of 95%. Calculate basic dynamic capacity of bearing which takes up the axis thrust. So that it can be selected from manufacturer's catalogue based on reliability of 90%.

Assume :- shock load factor = 1.25, radical factor = 0.56
thrust factor = 1.2. **[10]**

OR

Q8) a) How do you express the life of a bearing? What is an average or median life? **[6]**

b) A ball bearing operates on work cycle consisting of three parts : a radial load of 3000N at 720 rpm for 30% of the cycle, a radial load of 7000 N at 1440 rpm for 40% of the cycle and a radial load of 5000 N at 900 rpm for remaining part of the cycle. The basic dynamic capacity of the bearing is 30700 N. Calculate :

i) Rating life of bearing in hours.
ii) Average speed of rotation. **[10]**
iii) Life of bearing with 95% reliability.

Q9) a) State the general guidelines in designing control panels and displays. **[6]**

b) A shaft fitted with a flywheel rotate at 250 rpm and drives a machine. The torque of machine varies in cyclic manner over a period of 3 revolutions. The torque rises from 750 Nm to 3000 Nm uniformly during $\frac{1}{2}$ revolution and remain constant for next one revolution. If then falls uniformly to 750 Nm during next $\frac{1}{2}$ revolution and remain constant for one revolution, the cycle being repeated thereafter. Determine power required to drive machine. If total fluctuation of speed is not to exceed 3% of mean speed, determine suitable diameter and crosssection of flywheel rim. The width of rim is to be 4 times the thickness and safe centrifugal stress is 6 MPa. The material density is 7200kg/m^3. **[10]**

OR

Q10) a) Explain general guidelines for designing for machining and forging. **[6]**

b) A punching machine makes 25 working strokes per minute and is capable of punching 25mm diameter holes in 18mm thick steel plates having a ultimate shear strength of 300 MPa. The punching operation takes place during $\frac{1}{10}$th of a revolution of crank shaft. Estimate the power needed for the driving motor. Assuming a mechanical efficiency of 95%. Determine suitable dimensions for the rim crosssection of flywheel. Which is to revolve at 9 times speed of crank shaft. The permissible coefficient of fluctuation of speed is 0.1.

The flywheel is to be made of C.I. having tensile stress of 6 MPa and density 7250kg/m^3. The diameter of flywheel must not exceed 1.4m owing to space restrictions. The hub and spokes may be assumed to provide 5% of rotational inertia of the flywheel. Check for centrifugal stress induced in rim. **[10]**

Q11) a) Explain following terms used in Johnson's method of optimum design. **[8]**

i) Primary design equations.
ii) Limit equations.
iii) Functional requirement parameters.
iv) Undesirable effect parameters.

b) A shaft and hole assembly of nominal diameter 30mm have the following dimensions. Shaft diameter = $30^{-0.1}_{-0.15}$ mm, Hole diameter = $30^{+0.1}_{+0.0}$ mm. Assuming the shaft and hole diameters are normally distributed determine.

i) Percentage of assemblies having clearance less than 0.14mm.

ii) Percentage of assemblies having clearance greater than 0.20mm.

The areas below the standard normal distribution curve from zero to z are as follows : **[10]**

Z	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
Area	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554	0.4641	0.4713	0.4772

OR

Q12) a) What is significance of the 'normal distribution curve' in engineering statistical analysis? State its limitations. **[6]**

b) In light weight equipment, a shaft is required to transmits 40kW power at 425 rpm. The required stiffness of the shaft is 90Nm/degree. The factor of safety based on yield strength in shear is 1.5. Using maximum shear stress theory, design the shaft with objective of minimizing the weight, out of following materials : **[12]**

Material	Mass density ρ kg/m^3	Material cost per unit weight c Rs/N	Tensile yield strength Syt N/mm^2	Modulus of Rigidity G N/mm^2
Alloy steel	7800	1.50	450	82×10^3
Aluminium Alloy	2800	6.75	150	27×10^3
Titanium Alloy	4500	112	800	41×10^3
Magnesium Alloy	1800	7.65	100	17×10^3

Total No. of Questions : 12]

SEAT No. :

P974

[Total No. of Pages : 3

[4163]-35

T.E. (Production) (Common with Sandwich)

METAL CUTTING AND TOOL DESIGN

(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt one question of each unit from Section-I and Section-II.***
2) ***Answers to the questions should be written on separate books.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data if required.***

SECTION - I

Unit - I

Q1) a) A tool with 15 degree rake angle is used at a speed 30 m/min, feed 0.50 mm/rev, chip thickness ratio 0.75. Cutting force is 1200N and feed force 300N, Find - **[10]**

i) Chip thickness,
ii) Shear plane angle,
iii) Coefficient of friction,
iv) Shear force on shear plane,
v) Velocity of chip along tool face.

b) Discuss the various forces encountered in metal cutting. Explain Merchant's fore circle. **[5]**

c) Explain the procedure for force measurement on Lathe M/c for turning operation. **[5]**

OR

Q2) a) While machining a Mild steel rod on lathe machine following results were obtained. **[10]**

i) Width of cut = 2 mm,
ii) Feed = 0.30 mm/rev,
iii) Speed = 100 m/min,
iv) Rake angle = 10 degree,

P.T.O.

v) Tangential cutting force = 1100 N,
vi) Feed thrust force = 400 N,
vii) Cut chip thickness = 0.5 mm.

Calculate :

1) Shear force,
2) Normal force at shear plane,
3) Friction force,
4) Coefficient of friction,
5) Specific energy in cutting.

b) Explain how following factors affecting on chip formation. **[10]**

i) Speed,
ii) Coolant,
iii) Feed,
iv) Rake angle,
v) Approach angle.

Unit - II

Q3) a) Explain tool signature in ASA method. **[8]**

b) List different tool material. State the requirements of tool material. **[7]**

OR

Q4) a) Explain different ways to improve the life of cutting tool. **[7]**

b) Explain the geometry of a reamer tool. **[8]**

Unit - III

Q5) a) State the properties of cutting fluids used in metal cutting and their selection. **[7]**

b) Write a short note on : **[8]**

i) Factors affecting on tool life.
ii) Tool wear.

OR

Q6) a) Explain with neat sketch heat affected zone in metal cutting. **[7]**

b) What are the various causes of tool failure? Are these causes be either eliminated or reduces? If yes, how, if no why? **[8]**

SECTION - II

Unit - IV

Q7) a) Explain with a neat diagram the various elements of a twist drill. **[7]**

b) Discuss how you will design the principal elements of a milling cutter. **[8]**

OR

Q8) a) Explain the methods for manufacturing of a cutting tool. **[8]**

b) Discuss design consideration of a broach tool. **[7]**

Unit - V

Q9) a) Explain any two types of jig. **[8]**

b) Explain the different principles of clamping. **[7]**

OR

Q10) a) Explain with neat sketch the different types of bushes. **[8]**

b) Explain locating-Pin, locating pad, diamond pin. **[7]**

Unit - VI

Q11) Design a jig for drilling 2 holes of **Φ** 15 mm holes for a component shown in fig. No.1 **[20]**

OR

Q12) Design a Milling fixture for **Φ** 60 mm and length 75 mm for a component shown in fig.No.1 **[20]**

Draw minimum two views of your design, show the component in position, name all important elements in drawing, write a part list of your design and draw detail view for locating, clamping, and bushing.

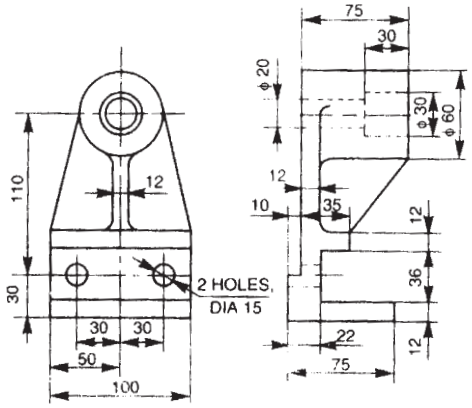

fig No.1

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Total No. of Questions : 12]

SEAT No. :

P975

[Total No. of Pages : 2

[4163]-37

T.E. (Production) (Common to Production S/W)

MANUFACTURING PROCESS - II

(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Discuss roll of flux and filler metal in welding process? **[6]**

b) Explain with neat sketch TIG welding with its advantage, disadvantage & application. **[10]**

OR

Q2) a) Discuss non-conductor female method & semiconductor cartridge method. **[10]**

b) Explain std coding (marking) system of electrodes. **[6]**

Q3) a) Explain with neat sketch types of flame produced in gas welding. **[10]**

b) Discuss spot resistance welding with it's application. **[6]**

OR

Q4) a) How gas welding torch is different from gas welding cutting torch, explain in detail. **[10]**

b) Describe flash welding process. **[6]**

Q5) a) Compare brazing, soldering & welding. **[9]**

b) Explain with neat sketch laser welding process. **[9]**

P.T.O.

OR

Q6) a) Explain brazing & braze welding process in detail. **[9]**

b) Describe electron beam welding process with its application. **[9]**

SECTION - II

Q7) a) Explain types of gatting systems. **[6]**

b) What is Gatting ratio? Give its importance in casting process. **[10]**

OR

Q8) a) Discuss effect of chills, exothermic materials in casting. **[6]**

b) Explain with neat sketch directional & progressive solidification. **[10]**

Q9) a) Explain thread rolling process. **[6]**

b) Discuss gear shapping & gear sharing process with its application. **[10]**

OR

Q10) a) Discuss thread chasing & die threading process. **[6]**

b) Compare lapping, Hoining & burnishing process. **[10]**

Q11) a) Explain working ultrasonic machining process and write its application. **[10]**

b) Discuss the R-C. circuit in EDM. **[8]**

OR

Q12) a) Explain AJM process in detail. **[10]**

b) Discuss working & principle of ECM process. **[8]**

✷ ✷ ✷

Total No. of Questions : 12]

SEAT No. :

P976

[Total No. of Pages : 3

[4163]-38
T.E. (Production)
METROLOGY AND QUALITY CONTROL
(2003 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State wavelength standard. Explain slip gauges and describe their manufacturing. **[8]**

b) Describe the use of four balls and height gauge for finding the diameter of the base. **[5]**

c) Define : **[3]**

i) Resolution.
ii) Uncertainty.

OR

Q2) a) Explain degree of uncertainty. **[4]**

b) Differentiate between : **[8]**

i) Systematic error & Random error.
ii) Gauges and Instrument.

c) Explain sources of error in dimensional instrument. **[4]**

Q3) a) Differentiate between Mechanical, Electrical, Pneumatic comparator. **[9]**

b) Explain different methods of squareness testing and state their application. **[7]**

OR

P.T.O.

Q4) a) Design a plug and ring gauge to control the production of 90 mm shaft and hole pair H8 e8 **[10]**

i) 90 mm lies – 80 to 100 mm.
ii) $e = -11\ D^{0.41}$
iii) IT8 = 25i,
iv) IT9 = 40i

b) Explain Taylor principle of gauge design. **[6]**

Q5) a) Define : **[10]**

i) Primary texture.
ii) Secondary texture.
iii) Ra value.
iv) RMS value.
v) Lay.

b) Describe with sketch gear pitch measuring m/c. **[8]**

OR

Q6) a) Differentiate co-ordinate measuring and universal measuring machine. **[8]**

b) Explain with neat sketch gear tooth vernier caliper and derive the relation for $d = \frac{nm}{2}\left[1 + \frac{2}{N} - \text{Cos}\frac{90}{N}\right]$. **[10]**

SECTION - II

Q7) a) Explain Demings 14 point of quality control approach. **[8]**

b) Explain Juran triology diagram. **[8]**

OR

Q8) a) What is process capability and capability index? Describe it's use. **[8]**

b) Differentiate between quality assurance and quality surveillance. **[8]**

Q9) a) Differentiate between angle sampling, double sampling, sequential sampling plan. **[8]**

b) Explain Quality function deployment. **[8]**

OR

Q10) a) Explain 7 QC Tools. **[10]**

b) What are ISO 14000. **[6]**

Q11) a) Explain history and evolution of ISO 9000 series standards. **[9]**

b) Explain Design of Experiment. **[9]**

OR

Q12) Write a short note on : **[18]**

a) Statistical Quality Control.

b) Malcom balbridge award.

c) Quality Audit.

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Total No. of Questions : 12]

SEAT No. :

P977

[Total No. of Pages : 2

[4163] - 41
T.E. (Electrical)
Microprocessor Fundamental & Applications
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain flags and flag register in 8085. **[8]**

b) What is timing and control circuit? What is its function? **[8]**

OR

Q2) a) Which are the buses available on 8085A? Explain their functions in details. **[8]**

b) Explain function of following pins. **[8]**

$\overline{INTA}$, HLDA, S_0, S_1, ALE, READY, HOLD, SID.

Q3) a) Draw necessary timing diagram for execution of instruction MVI B, 08; memory location 4444H. **[8]**

b) Write a program in assembly language to count number of '1' bits in register B. Store the result at memory location D050H. **[8]**

OR

Q4) a) Assume that there is only one byte 'FF' in the array of 10 bytes store from 4000H onwards. Write ALP to search this byte and store result at D050H. **[8]**

b) Describe following instruction indetails. **[8]**

i) DAA.

ii) PUSH PSW.

iii) PCHL.

iv) SHLD.

P.T.O

Q5) a) What is Boud rate? Explain synchronous, asynchronous serial and parallel data transfer. **[12]**

b) Explain RS232 standard of serial communication. **[6]**

OR

Q6) a) Explain various data transfer technique. **[9]**

b) Draw functional block diagram for USART and explain concept of serial communication. **[9]**

SECTION - II

Q7) a) Explain operating modes of 8255. Give its control word format. **[8]**

b) Explain mode 0 and mode 1 of 8254. **[8]**

OR

Q8) a) Explain functional block diagram of 8255. **[8]**

b) Explain Block diagram of 8279. **[8]**

Q9) a) Draw interfacing diagram of ADC to 8085. Explain important signals. **[8]**

b) Explain RMS voltage and current measurement using 8085 with block diagram. **[10]**

OR

Q10) a) Using DAC write a program to generate ramp wave form. **[8]**

b) Interface stepper motor with 8085 and write ALP for clockwise rotation. **[10]**

Q11) a) Draw flag register of 8086 & explain function of each flag. **[6]**

b) With neat diagram explain architecture of 8086. **[10]**

OR

Q12) a) Explain minimum and maximum modes of 8086. **[10]**

b) Explain the functions of following pins. **[6]**

i) TEST.

ii) DT / $\overline{R}$.

iii) NMI.

Total No. of Questions : 12]

SEAT No. :

P978

[Total No. of Pages : 4

[4163] - 42
T.E. (Electrical)
ELECTRICAL MACHINES - II
(2003 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with neat sketches, how rotating magnetic field is developed when 3 phase balanced supply is given to the stator windings of a 3 phase induction motor. Give the frequency of such field and it's magnitude. **[8]**

b) A 3-phase, 50Hz, 4-pole induction motor has a slip of 4%. **[8]**

Calculate :

i) Speed of the motor,

ii) Frequency of rotor emf.

If the rotor has a resistance of 1 Ω and standstill reactance of 4 Ω , calculate the power factor

1) at standstill,

2) at a speed of 1400 r.p.m.

OR

Q2) a) Explain how a slip ring induction motor differ in construction, starting method, performance and applications with respect to cage induction motor. **[6]**

b) Derive an expression for torque of a 3-phase induction motor and obtain the condition for maximum torque. **[6]**

P.T.O

c) A 440 V, 50 Hz, squirrel cage induction motor has a ratio of standstill reactance to resistance of rotor per phase of 3 to 1 and a maximum torque which is 4 times the normal full load torque. **[4]**

Calculate:

i) full - load slip.

ii) ratio of starting torque to full load torque.

Q3) a) Derive a relationship between rotor input power, rotor copper loss and power developed at shaft of a 3 - phase induction motor. **[8]**

b) A 6 pole, 50 Hz, 3ϕ induction motor running on full load develops a useful torque of 150 Nm at a rotor frequency of 1.5 Hz. Calculate the shaft power output. If the mechanical torque lost in friction is 10 Nm, determine, **[8]**

i) rotor copper loss,

ii) the input to the motor,

iii) the efficiency.

The total stator loss is 700 W.

OR

Q4) a) Draw the equivalent circuit of a 3-phase induction motor. Describe a method to determine the various parameters of the equivalent circuit in the laboratory. **[8]**

b) Draw the circle diagram for a 3 phase , 6 pole, 50 Hz, 400 V, star connected induction motor from the following data, **[8]**

No load test : 400 V, 10 A, 1400 W (line values).

Short - Circuit test : 200 V, 55 A, 7000 W (line values).

The stator loss at standstill is 60% of the total copper losses and full load current is 30 A. From the circle diagram determine;

i) Power factor, slip, output and torque at full load.

ii) Starting torque.

iii) Maximum power output.

iv) Maximum torque in synchronous watts.

Q5) a) With the help of a neat diagram explain the operation of a direct on line starter to start a 3 phase induction motor. Also derive the relation between starting torque and full load torque in terms of starting current, full load current and slip at full load. **[10]**

b) It is desired to install a 3-phase cage induction motor restricting the maximum line current drawn from a 400 V, 3 phase supply to 120 A. If the starting current is 6 times full load current, what is the maximum permissible full load kVA of the motor when

i) It is directly connected to the mains.

ii) It is connected through an auto-transformer with a tapping of 60%. **[8]**

OR

Q6) a) Explain with the help of diagram, construction and principle of operation of a double cage induction motor. Draw its equivalent circuit and torque speed characteristics. **[10]**

b) The resistance and reactance (equivalent) values of a double cage induction motor for stator, outer and inner cage are 0.25, 1.0 and 0.15 ohm resistance and 3.5, zero and 3.0 ohm reactance respectively. Find the starting torque if the phase voltage is 250 V and the synchronous speed is 1000 rpm. **[8]**

SECTION - II

Q7) a) Explain the phenomena of cogging, crawling and noise production in a 3-phase induction motor. **[8]**

b) What are the various methods of braking of a 3-phase induction motor? Explain any one method with a circuit diagram. **[8]**

OR

Q8) a) List various tests to be performed on 3-phase induction motor as per Indian standards. **[8]**

b) Explain construction, principle of working of 3 phase induction voltage regulator. What are it's advantages over auto-transformer? **[8]**

Q9) a) Draw the circuit diagram of a capacitor - start capacitor run single phase induction motor and explain it's working. Where this type of motor is commonly used? **[8]**

b) A 220 V, single phase induction motor gave the following test results:

Blocked rotor test : 120 V , 9.6 A, 460 W.

No load test : 220 V, 4.6 A, 125 W.

The stator winding resistance is 1.5 Ω, and during the blocked rotor test, the starting winding is open. Determine the equivalent circuit parameters. **[8]**

OR

Q10) a) Using double revolving field theory, explain why a single phase induction motor is not self starting? Hence draw it's torque - slip characteristics for both forward and backward running motor. **[8]**

b) Discuss the procedure for determining the parameters of equivalent circuit of a single phase induction motor. **[8]**

Q11) a) What problems are noticed when a d.c. series motor is connected across a a.c. supply of an equivalent voltage rating? How these are overcome? **[6]**

b) With the help of suitable diagram explain how unidirectional torque is produced in an a.c. single phase series motor. **[6]**

c) A universal series motor has resistance of 30 Ω and an inductance of 0.5 H. When connected to a 250 V d.c. supply and loaded to take 0.8 A, it runs at 2000 r.p.m. Estimate it's speed and power factor. When connected to a 250 V, 50 Hz a.c. supply and loaded to take the same current. **[6]**

OR

Q12) a) What are compoles? Discuss various types of compoles commonly used in a A.C. Series motor. **[6]**

b) Briefly describe the construction of a fractional kW single phase series motor. Sketch it's phasor diagram. Mark various emfs and voltage drops on it. State the expressions for the magnitude of various emfs induced in its windings and their frequencies. **[6]**

c) Draw the circle diagram of a universal motor and indicate on it various performance parameters of the motor. **[6]**

Total No. of Questions : 12]

SEAT No.:

P983

[Total No. of Pages : 2

[4163]-50
T.E. (Electrical)
ELECTRICAL INSTALLATION MAINTENANCE AND TESTING
(2003 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any one question from each unit.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Compare 1 phase 1 wire overhead system with 3 phase 4 wire overhead system for volume of conductor material required. **[10]**

b) Draw single line diagram of typical AC supply distribution system. **[6]**

OR

Q2) a) A 200 m long distributor is fed at point 'A' and is loaded as 50 A at 0.85 lag p.f. and 90 A at 0.9 lag p.f. at point 'B' and Point 'C' respectively. Point 'B' is midpoint of feeder. Power factors at both load points are referred to the voltage at point 'C'. The impedance of each section is 0.2 + 0.3. Calculate the sending end voltage and current and if the voltage at point 'C' is maintained at 230V. **[10]**

b) State and explain Kelvins law and discuss its limitations. **[6]**

Unit - II

Q3) a) Explain in detail classification of substations. **[8]**

b) Write note on tolerable touch and step potential. **[8]**

OR

Q4) a) Draw the single line diagram of duplicate bus bar system used in substations. List various equipments used in it. **[8]**

b) Discuss in detail the different factors which affect the soil resistivity. **[8]**

P.T.O.

Unit - III

Q5) a) Explain following maintenance strategies. **[10]**

i) Breakdown maintenance.
ii) Planned maintenance.
iii) Condition based maintenance.

b) Explain the DC test for measurement of insulation resistance. Draw the relevant diagram. **[8]**

OR

Q6) a) Discuss the various insulation stressing factors. **[10]**

b) Explain the importance and necessity of maintenance. **[8]**

SECTION - II

Unit - IV

Q7) a) What is dissolved gas analysis? Discuss the DGA concept in context with condition monitoring of transformers. **[10]**

b) Explain the standard procedure of testing on transformer insulation oil. **[8]**

OR

Q8) a) Discuss in detail different methods for partial discharge measurement. **[10]**

b) Write note on condition monitoring of on load tap changer used in power transformers. **[8]**

Unit - V

Q9) a) Discuss in detail various causes of failure of motors. **[8]**

b) What is thermography? How it is used in condition monitoring? **[8]**

OR

Q10) a) Explain in detail condition monitoring of power cables. **[8]**

b) Write note on Signature Analysis and its use in condition monitoring of electrical equipments. **[8]**

Unit - VI

Q11) a) What are different failures modes of bearing? **[8]**

b) Write note on Tell Tale Signs on bearings. **[8]**

OR

Q12) a) Explain the nomenclature of the bearings. Draw the relevant figures. **[8]**

b) What is vibration signature analysis? How it is used for failure analysis of rotating machines? **[8]**

Total No. of Questions : 10]

SEAT No. : ____

P992

[Total No. of Pages : 3

[4163] - 61

T.E. (Instrumentation & Control)

MICRO CONTROLLER TECHNIQUES

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With the help of neat diagrams, explain the interfacing of external program and data memory to 8051. **[8]**

b) Explain the following instructions of 8051 **[8]**

i) DJNZ R5, label ii) ADD 53H, 63H

iii) LCALL DISPLAY iv) MOVC A, @A+DPTR

OR

Q2) a) Draw and explain the internal structure of port pins of Port 0 and Port 3 of 8051. **[8]**

b) Write a program to generate a decimal up counter in register R3, going through all the even stages only. **[8]**

Q3) a) Write a program to generate a square wave of 1 KHz with a 50% duty cycle at P1.0. Make use of internal timers of 8051 and explain the SFRs used for the same. Show calculations if any in detail. Assume crystal frequency as 6 MHz. **[10]**

b) Explain the different mode 1 and mode 2 of timers in 8051 with neat diagram. **[8]**

P.T.O.

OR

Q4) Write a program to measure width of a pulse using 8051 **[6]**

Also draw the flowchart for the same. **[4]**

With neat diagram explain the connections done to measure pulse width. **[2]**

If the Timer registers read a value of 35F1H, interpret the pulse width in microseconds if F_{OSC} = 6 MHz and if F_{OSC} = 2 MHz **[6]**

Q5) With neat diagrams write short notes on: (any two) **[16]**

a) Interfacing of LCD display to 8051.

b) Interfacing of DAC.

c) Multiplexed LED display using 8051.

SECTION - II

Q6) a) With a neat diagram, explain the interfacing of RTC to 8051. **[8]**

b) Compare RS 232 and RS 485 with respect to following points: **[10]**

i) No. of drivers

ii) No. of receivers

iii) Supports Half Duplex, Full Duplex or both

iv) Maximum Distance

v) Maximum Speed at Maximum distance.

OR

Q7) An 8051 based 2 tank level control system is to be designed. The pump of lower tank is turned on and off with a relay. Level switches are used for level sensing. The system is user friendly and has a 4 × 2 keys keyboard.

The working is as follows:

a) When the level in the overhead tank reaches high level, or the level in the underground tank goes below low level, the pump stops.

b) When the level in the overhead tank reaches low level, or the level in the underground tank reaches high level, the pump starts.

Draw the scheme in detail covering the following points:

i) Block Diagram. **[4]**

ii) Keyboard interfacing **[4]**

iii) Relay Interfacing for pump on off. **[4]**

iv) Power on indicator. **[2]**

v) A general flowchart for the system. **[4]**

Q8) a) Write a program in PIC to complement the remaining bits of Port B when the Port B interrupt occurs. **[8]**

b) Explain the following instructions of PIC **[8]**

i) DECFSZ f, d ii) BSF f, b

iii) BTFSC f, b iv) SLEEP

OR

Q9) a) Write a program in PIC to add 2 16 bit numbers. **[8]**

b) Explain the structure of stack and role of stack in PIC 16CXX. **[8]**

Q10) Write short notes with respect to PIC 16F8XX (any two) **[16]**

a) Interrupt structure.

b) Capture, Compare and PWM Module.

c) Architectural features.

Total No. of Questions : 12]

SEAT No. : ____

P993

[Total No. of Pages : 3

[4163] - 63

T.E. (Instrumentation and control)

CONTROL SYSTEM COMPONENTS

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A 4 pole, 50Hz, 440V three phase induction motor develops 25h.p. inclusive of mechanical losses. When this motor runs at speed 1440 rpm the motor power factor is 0.82 lag. Calculate **[10]**

i) Rotor copper loss.

ii) Total input if stator losses are 1800W

iii) Line Current.

iv) Slip

v) Overall efficiency if mechanical losses are 750W (1hp = 135.5W)

b) Explain the following characteristics of DC series motor. **[8]**

i) Torque & armature current

ii) Speed & torque.

OR

Q2) a) Explain the features of three phase synchronous motor. **[6]**

b) Compare squirrel cage induction motor with slip ring induction motor with respect to construction, performance & application. **[6]**

c) Explain Universal motor with diagram. Give its applications. **[6]**

P.T.O.

Q3) a) List 3 types of stepper motors and explain the construction & working principle of permanent magnet stepper motor. **[6]**

b) Explain the following terms in relation to stepper motor. **[6]**

i) Maximum Pull in Rate ii) Maximum Pull out rate

iii) Maximum Pull torque.

c) What are the differences between Stepper motor & DC servomotor. **[4]**

OR

Q4) a) Explain in detail brush less DC Servomotor and its applications. **[8]**

b) A 4 pole, lap wound dc shunt generator has 64 slots each carrying 10 conductors. Its shunt field resistance is 70Ω & armature resistance of 0.03 . Find the speed of the machine when supplying 100kW at a terminal voltage of 250V. **[8]**

Q5) a) What is a level Switch? Explain its working with neat sketch. Develop an electrical wiring diagram for controlling a level at high & low level of an overhead tank. State the assumptions clearly. **[10]**

b) Draw and explain industrial contactor. Give its 2 applications. **[6]**

OR

Q6) a) What is a Pressure Switch? Explain its working with neat sketch. Develop an electrical wiring diagram for controlling compressor pressure. State the assumptions clearly. **[10]**

b) Compare EMR with SSR. **[6]**

SECTION - II

Q7) a) Develop an electrical wiring diagram, using standard symbols for reversal of electric motor. **[6]**

b) Define the term interlock. Explain its necessity with suitable example. **[6]**

c) Draw wiring diagram and Explain the overload protection circuit in Mixer grinder. **[6]**

OR

Q8) a) What is braking of motors. What are the various methods of braking. Draw electrical wiring diagram for any one type. How direction of 3 phase induction motor can be reversed. Develop electrical wiring diagram for the same. **[10]**

b) List 4 types of starters and explain any one starter in detail. **[8]**

Q9) a) Explain the pneumatic power supply with neat sketch. **[8]**

b) Draw a pneumatic circuit for controlling cylinder A and cylinder B. The sequence is A + B + A- B-. Use limit switch 1 and Limit switch 2 for cylinder motion control. Draw step displacement diagram. **[8]**

OR

Q10)a) Write short notes and draw timing diagram for **[8]**

i) Pneumatic On Time delay valve.

ii) Pneumatic Off Time delay valve.

b) Draw the Pneumatic circuit for the automatic To & Fro motion of the piston (Reciprocating motion). **[8]**

Q11)a) Explain Meter-in & Meter-out control in details. **[8]**

b) Compare Hydraulic & Electrical system. **[8]**

OR

Q12)a) Explain Hydraulic power supply in detail with neat sketch. **[8]**

b) Explain with neat sketch working of pressure reducing valve in hydraulic circuit. **[8]**

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Total No. of Questions : 12]

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T.E. (Instrumentation & Control)

ANALYTICAL INSTRUMENTATION

(2003 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Your answers will be valued as a whole.***

SECTION - I

Q1) a) Explain principle and instrumentation used for potentiometry. **[8]**

b) Explain principle and instrumentation used for voltametry. **[8]**

OR

Q2) a) Draw electromagnetic spectrum and write one source, one detector and one instrumental method for each range. **[10]**

b) What are the advantages of instrumental methods over classical methods? **[6]**

Q3) a) State Beer-Lambert's law and write a note on "Deviation of Beer-Lambert's law" **[10]**

b) Differentiate: **[6]**

i) Prism and Diffraction grating ii) Filter and Monochromator.

OR

P.T.O.

Q4) a) With a neat diagram, explain working of Flame photometer. **[8]**

b) Explain with a neat diagram working of a hollow cathode lamp. **[8]**

Q5) a) Explain the principle of Flame photometry. With a neat diagram explain working of Flame Photometer. **[9]**

b) Explain working of Inductively Coupled Plasma source. **[9]**

OR

Q6) Write notes on **[18]**

a) IR detectors.

b) Photo Multiplier Tube.

c) Interference filter.

SECTION - II

Q7) a) Explain with a block diagram working of Mass Spectrometer. **[8]**

b) Enlist various types of Mass Analyzers and explain one Mass Analyzer in detail **[8]**

OR

Q8) a) Explain with a neat diagram working of a Gas Chromatograph (GC). What are ideal characteristics of carrier gas? **[8]**

b) Write a note on Flame Ionization Detector. **[8]**

Q9) a) Explain working of NMR spectrometer. What is chemical shift in NMR. **[8]**

b) What is fluorescence. Explain with a neat diagram principle and working of a Spectrofluorimeter. **[8]**

OR

Q10)a) Explain working of O_2 analyzer. Also explain importance of gas analyzers. **[8]**

b) What is Raman effect? Explain working of Raman Spectrometer. **[8]**

Q11)a) Explain Bragg's law and also explain working of X-ray diffractometer. **[9]**

b) What is Auger electron? Explain Auger spectroscopy. **[9]**

OR

Q12)Write notes on **[18]**

a) Abbey refractometer.

b) GM Counter.

c) Mass spectrometer detectors.

Total No. of Questions : 12]

SEAT No. :

P995

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T.E. (Instrumentation & Control)

ELECTRONIC INSTRUMENTATION

(2003 Pattern) (Sem. I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Q meter with respect to **[8]**

i) Principle of working with circuit diagram.

ii) Practical Q meter circuit.

b) Explain Automatic Test equipment with neat Block diagram. State its advantages and disadvantages. **[10]**

OR

Q2) a) Explain circuit diagram of RMS convertor used in digital multimeter.**[8]**

b) Find True RMS value of sine wave with peak amplitude V_p=4volts superimposed on d.c. voltage of 4 volts. **[4]**

c) Short note on Peak-to Peak reading voltmeter. **[6]**

Q3) a) Explain any four pulse characteristics with the help of suitable diagram.**[8]**

b) Give four differences between function generator and Frequency synthesizer. **[8]**

P.T.O.

OR

Q4) a) Explain pulse generator using Astable multivibrator, differentiator and Monostable multivibrator. **[12]**

b) Short note on Function Generator. **[4]**

Q5) a) Explain working of sampling Oscilloscope with neat block diagram and waveform. **[10]**

b) Explain vertical sensitivity and Bandwidth with respect to Dual trace Oscilloscope. **[6]**

OR

Q6) a) Explain practical set up to measure relay contact changover using Digital storage oscilloscope with waveform. **[8]**

b) Explain significance of roll mode and pretrigger Mode in Digital storage oscilloscope. **[8]**

SECTION - II

Q7) a) Calculate conversion time for 12 bit successive approximation type ADC if clock frequency is 1 MHz. **[4]**

b) Explain any four performance characteristics of ADC. **[12]**

c) Give one difference between Flash type ADC and dual slope integrating type ADC. **[2]**

OR

Q8) a) Explain significance of sample & hold circuit and multiplexer in ADC. **[6]**

b) Explain single slope ramp type of ADC with the help of neat diagram. **[6]**

c) Short note on data logger. **[6]**

Q9) a) Explain following sources of errors in universal counter **[8]**

i) $\pm$ 1 count error ii) Time base Error

b) Explain Autoranging and autozeroing techniques in digital instrument. **[8]**

OR

Q10) Explain following Modes of universal counter with neat diagram and waveform. **[16]**

a) Ratio Mode

b) Time interval Mode

c) Totalizing Mode

d) Period Mode.

Q11) a) What is necessity of Distortion meter? Explain following Fundamental suppression methods used in distortion meter. **[12]**

i) Bridge T network

ii) Wein Bridge.

b) Short note on virtual instrumentation. **[4]**

OR

Q12) a) Explain logic analyzer with neat block diagram. **[8]**

b) What is modulation? Give three difference between Amplitude Modulation and Frequency modulation. **[8]**

Total No. of Questions : 12]

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T.E. (Instrumentation & Control)

DIGITAL SIGNAL PROCESSING

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the Z-Transform of the following signals including its ROC: **[10]**

i) $x_1[n] = e^{-n/40}\, u[n]$; ii) $x_2[n] = e^{-n/40}\, \sin\left(\frac{2\pi n}{8}\right) u[n]$.

b) A system described by the following difference equation: **[6]**

$$y[n]+\frac{3}{4}y[n-1]+\frac{1}{8}y[n-2]=x[n]+x[n-1]$$

i) Find impulse response of the system.

ii) Realize the system using parallel form.

OR

Q2) a) Explain the effect of finite word length in digital filter. **[6]**

b) Determine Direct form-I and Direct form - II of **[10]**

i) $2y[n] + y[n-1] - 8y[n-3] = 2x[n] + 9x[n-5]$.

ii) $y[n] - 0.15y[n-1] + 0.8y[n-2] - x[n] - 2x[n-1] = 0$.

P.T.O.

Q3) a) Determine the 4-point DFT of the following sequences: **[6]**

i) $x[n] = u[n] - u[n-4]$

ii) $x[n] = \cos \pi n \qquad 0 \leq n \leq 3.$

b) State and prove the Circular convolution and Periodic property of DFT. **[6]**

c) Determine the circular convolution of $x[n] = \{2, 1, 2, 1\}$ and $y[n] = \{1,2\}$ **[4]**

OR

Q4) a) Compute the 8-point DFT of $x[n] = (0.5)^n$ Using DIF - FFT. **[8]**

b) Deduce the derivation of radix-2 DIT-FFT algorithm. **[8]**

Q5) a) List out and explain the different types of window functions used for finite impulse response (FIR) filter design. **[6]**

b) Design the symmetric FIR LPF for the following constraints:

$$H_d(\omega) = \begin{cases} e^{-j\omega T} & |\omega| \leq \omega_c \\ 0 & \text{otherwise} \end{cases}$$

The length of filter should be 7 and $\omega_c = 1$ rad per samples. Use Hamming window. **[12]**

OR

Q6) a) Compare FIR and IIR filters with their advantages and disadvantages. **[6]**

b) Determine the FIR filter coefficient for M = 7 for the following specifications. **[12]**

$$H_d(\omega) = \begin{cases} e^{-3j\omega} & -\frac{\pi}{4} \leq |\omega| \leq \frac{\pi}{4} \\ 0 & \frac{\pi}{4} \leq |\omega| \leq \pi \end{cases}$$

Use Hamming window with N = 7.

SECTION - II

Q7) a) Explain Impulse invariance scheme. What is the drawback and how Bilinear transformation overcomes it. Explain concept of frequency pre-warping. **[8]**

b) With the help of Bilinear z-transformation, design a digital Butterworth filter which satisfies the following constraints: **[10]**

$$\frac{9}{10} \leq |H(e^{j\omega})| \leq 1 \qquad 0 \leq \omega \leq 0.5\pi$$

$$|H(e^{j\omega})| \leq \frac{4}{20} \qquad 0.75\pi \leq \omega \leq \pi$$

OR

Q8) a) Compare impulse invariance method and bilinear transformation method of infinite impulse response (IIR) filters. **[5]**

b) Explain the frequency transformations to convert low-pass filter to high-pass filter, and band-pass filter. **[4]**

c) Convert an analog filter with system function H(s) into digital IIR filter. Using impulse invariance method. **[9]**

$$H(s) = \frac{10}{s^2 + 7s + 10}$$

Q9) a) List out any four applications of **[8]**

i) Fixed-point processor

ii) Floating point processor.

b) What are the different data types supported by the TMS320 C67xx DSP processor? Also explain their ranges in detail. **[8]**

OR

Q10)a) List out the salient features of TMS320 C67xx processor. **[8]**

b) Explain in detail the cross path in DSP processor. **[8]**

Q11)a) Write a short note on: **[8]**

i) Fetch packet and execute packet.

ii) Logical instructions.

b) Draw and explain the architecture of Harvard and modified Harvard architecture. **[8]**

OR

Q12)a) List out any eight applications of TMS320 C67xx platform. **[8]**

b) List out the four features of Instruction set of TMS320 C67xx processor. **[8]**

Total No. of Questions : 12]

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P997

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T.E. (Instrumentation and Control)

PROCESS PLANT OPERATION

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What do you mean by unit process and unit operation. Discribe any from each of them with symbols. **[16]**

OR

Q2) Discribe basic concepts and principals of commonly used Unit Operations with the processes and their study related to distillation and drying. **[16]**

Q3) What is the role of kinetics and thermodynamics in process industries. **[16]**

OR

Q4) What are the types of reaction and reactors. Discuss in detail. **[16]**

Q5) What is energy balance and heat transfer coefficient. Discuss with suitable example. **[18]**

OR

Q6) What is material balance and mass transfer coefficient. Discuss with suitable example. **[18]**

P.T.O.

SECTION - II

Q7) Explain in detail about crushing, grinding, size seperation and screening. **[16]**

OR

Q8) Explain in detail about forth flotation and hydro cyclone. **[16]**

Q9) Explain basic concepts of corrosion & protection from corrosion. **[16]**

OR

Q10) Explain in detail about heat & surface treatments on metals. How will you select metals & alloys used in construction of field instruments. **[16]**

Q11) Draw and explain Process flow diagram for Cement industries. **[18]**

OR

Q12) Draw and explain Process flow diagram for Paper Industries. **[18]**

Total No. of Questions : 12]

SEAT No. :

P998

[Total No. of Pages : 2

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T.E. (Instrumentation & Control)

PROCESS LOOP COMPONENTS

(2003 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain a typical level control loop using P & ID symbols. **[8]**

b) Design a signal conditioning circuit for a sensor whose output range is 10 to 150 mV. with linear variation in temperature. The circuit must provide high input impedance with 0 to 5V output. **[10]**

OR

Q2) a) Draw P & ID symbols for the following with proper application. **[12]**

i) Level Alarm Low ii) Converter

iii) Flow Element iv) Pressure Switch

b) A level range of 2 to 3 m is linearly represented by a standard current range of 3 to 15 psi. What current will result from 2.3 m? What temperature does 9.5 mA represent? **[6]**

Q3) a) What are different types of converters used in process industries. Explain any one type with a neat sketch. **[8]**

b) Explain with the help of block diagram the working of SMART. **[8]**

OR

P.T.O.

Q4) a) Explain various process lags. **[8]**

b) Explain the Calibration of an electronic transmitter for a range of 50mm to 250mm Hg. **[8]**

Q5) a) Compare proportional, Integral and derivative control actions. **[10]**

b) Explain Time Proportional Controller. **[6]**

OR

Q6) a) Name and explain algorithms used in digital controllers. **[8]**

b) Compare Ziegler - Nichols method and process reaction method of tuning. **[8]**

SECTION - II

Q7) a) Explain with proper block diagram the different functions of input module of Programmable Logic Controller. **[8]**

b) Explain different types of timers. Develop ladder diagram for Flashing light with 2 seconds ON and OFF time. **[10]**

OR

Q8) a) Explain different PLC instructions. **[8]**

b) Develop ladder diagram for bottle filling plant. Assume suitable sequence. **[10]**

Q9) a) Explain different control valve characteristics. **[8]**

b) Compare double seated and single seated globe valves. **[8]**

OR

Q10)a) Explain the need of Valve Positioner. **[8]**

b) Define the following: **[8]**

i) Valve Coefficient ii) Rangeability

iii) Turndown iv) Valve trim

Q11)a) Explain various ISA sequences for an Alarm annunciator. **[8]**

b) What is purging? What are its types. **[8]**

OR

Q12)a) Explain Volumetric type of feeders. **[8]**

b) Explain the need of square root extractor. **[8]**

Total No. of Questions : 12]

SEAT No. :

P999

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T.E. (Printing Engineering)

PRINTING PROCESS INSTRUMENTATION

(2003 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section - I & solve Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw & explain block diagram of automatic control system in detail. Explain it with suitable example. **[10]**

b) Explain different types of errors in measurement. Also explain methods to overcome these errors. **[8]**

OR

Q2) a) Explain the following terms. **[10]**

i) Accuracy ii) Precision

iii) Resolution iv) Reproducibility

v) Threshold

b) Explain the term servomechanism with suitable example. **[8]**

Q3) a) Define the term transducer. Explain with suitable examples classification of transducers. **[8]**

b) Explain construction and working of LVDT in detail. **[8]**

P.T.O.

OR

Q4) a) What are the different methods for humidity measurement. Explain any one method in detail. **[8]**

b) Define the term strain gauge. Explain different types of strain gauge. **[8]**

Q5) a) Explain role of optodevices in printing applications. **[8]**

b) Draw and explain first order low pass Butterworth filter. Explain its design steps. **[8]**

OR

Q6) a) Write a short note on sample and hold circuit. **[8]**

b) Explain LASCR in detail. **[8]**

SECTION - II

Q7) a) Explain the following terms: **[10]**

i) Degree of freedom ii) Process Lag

iii) Control Lag iv) Process Equation

v) Process Load.

b) Explain Bang. Bang controller in detail. **[8]**

OR

Q8) a) With suitable example explain final control operation. **[8]**

b) Draw the output response of proportional, P+I, P+I+D, P+D controller when unit step input is applied. Also write the equation for P+I+D controller. **[10]**

Q9) a) With the help of circuit diagram explain electronic P+D controller. What are its limitations. **[8]**

b) Explain microprocessor based flow control system. What is the role of controllers in printing applications? **[8]**

OR

Q10)a) What is the standard output of pneumatic controller. Explain pneumatic proportional plus integral controller. **[8]**

b) Explain operational amplifier base proportional controller in detail. **[8]**

Q11)a) Define the term PLC. Draw & explain the architecture of PLC. **[8]**

b) Draw & explain block diagram & ladder diagram for bottle filling plant. **[8]**

OR

Q12)a) Write a short note on SCADA. **[8]**

b) Draw and explain data logger system in detail. **[8]**