COMPUTER SCIENCE AND APPLICATIONS

PAPER—III

NOTE : This paper is of two hundred (200) marks containing four (4) sections. Candidates are required to attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION - I

Note : This section contains five (5) questions based on the following paragraph. Each question should be answered in about thirty (30) words and each carries five (5) marks.

(5x5=25 marks)

ABC is a manufacturing company having a marketing department, which performs following activities :

- Preparation of Quotation

- Preparation of Order Acceptance

- Preparation of Manufacturing Advice

When the enquiry comes from the customer, marketing department will check that enquiry form against the customer and the given item details. If Company is manufacturing the items then they will prepare a quotation. In case, from the customer enquiry, if Company is manufacturing half of the items, then marketing department will prepare a quotation for those items only and for rest of the items they will prepare a rejection message.

After receiving the quotation from marketing department, customer will raise their purchase order according to the quotations terms and conditions.

After receiving the customer order, marketing department will prepare an order acceptance. After preparation of order acceptance, marketing department will prepare a Manufacturing Advice according to order acceptance. In this manufacturing advice, along with the necessary details, the quantity and delivery week number are mentioned, then it is forwarded to the planning department.

Analyse these business rules and

1. Draw functional decomposition diagram.

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2. E-R Diagram.

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3. Draw context level DFD.

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4. Design database.

5. List out queries and reports.

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SECTION - II

Note : This section contains fifteen (15) questions each to be answered in about thirty (30) words. Each question carries five (5) marks.

(5x15=75 marks)

6. Implement a half adder using only NOR gates.

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7. State the advantages of 16 bit microprocessor over 8 bit microprocessor.

8. Given that two different raster systems with resolutions of 640×480 and 1280×1024. What size frame buffer is needed for each of these systems to store 12 bits per pixel ? How much storage is required for each system if 12 bits per pixel are needed to be stored.

9. A polygon consists of three vertices A (2, 3), B (0, 10) and C (5, 10). If the polygon is moved such that A is at the new location (10, 10), find the new vertices of the polygon.

10. Why fragmentation and data replication are useful in Distributed DBMS ?

11. What are basic differences between optimistic concurrency control techniques and other concurrency control techniques ?

12. Compare multipath routing with flow-based routing.

13. What different types of Messages SNMP protocol can handle ?

14. What is Clipping in applet ? What is the relationship between clipping and repainting ?

15. What are three ways in which a thread can enter the waiting state ?

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16. What are the management functions of an operating system ?

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17. Explain the concept of recovery from deadlock.

18. Draw different flow charts whose cyclomatic complexity is equal to 3 ?

19. The cost estimation models are judged using both subjective and objective criteria - Justify.

20. Draw all the possible non-similar tree T where T is a binary tree with 3 nodes.

SECTION - III

Note : This section contains five (5) Electives. The candidate has to choose one Elective and has to answer all the five questions from that Elective. Each question carries twelve (12) marks and is to be answered in about two hundred (200) words.

(12x5=60 marks)

Elective - I

21. State and prove Chomskyan hierarchy of Languages.

22. Construct Turing machine to accept $L = \left\{ 0^n / n /_n \geq 0 \right\}$.

23. Explain context free grammar and regular grammar with example.

24. Prove that the following language is not regular using Pumping Lemma $L = \left\{ 0^{i^2} / i \geq 0 \right\}$.

25. Let $A = \{a, b\}$. Construct an automaton M such that L (M) will consist of those words W which begin with a and end in b.

OR

Elective - II

21. Consider the following generator matrix over GF (Z).

$$G = \begin{bmatrix} 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$

(a) Generate all possible code words using this matrix.

(b) Find the parity check matrix H.

(c) What is the minimum distance of this code ?

(d) How many errors can this code detect ?

(e) How many errors can this code correct ?

(f) Construct the standard array of this code.

22. Find the capacity of the channel of the following graph.
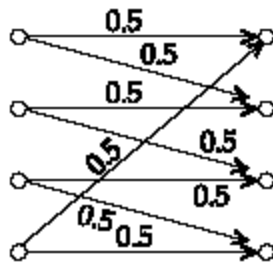
23. (a) Consider a discrete Memoryless Source with source probabilities {0.30, 0.25, 0.20, 0.15, 0.10}. Find the source entropy, H (X).

    (b) Show that C = {0000, 1100, 0011, 1111} is a linear code. What is its minimum distance ?

24. Describe MPEG1 and MPEG2 standards of compression.

25. Explain any one method of edge detection in image processing.

OR

Elective - III

(Operations Research)

21. Find by simplex method non-negative solutions of the following system of equations :

$$X_1 \qquad -X_3 + X_4 = 2$$
$$2X_1 + X_2 \qquad = 3$$
$$3X_1 - 2X_2 \qquad -X_4 = 1$$

22. Prove that a solution X_0 of the quadratic programming problem :

Minimize $\quad P^T X + \dfrac{1}{2} X^T C X$

Subject to $\qquad AX \geqslant b,$
$\qquad\qquad\quad X \geqslant 0$

is also a solution of the problem

Minimize $\quad P^T X + \dfrac{1}{2} X_0^T C X$

Subject to $\qquad AX \geqslant b,$
$\qquad\qquad\quad X \geqslant 0$

Where C is symmetric positive semi-definite matrix.

23. (a) Show that for any network, the maximal flow value from source to sink is equal to the minimal cut capacity of all cuts, separating source and sink.

(b) Find the shortest route through the following Network.
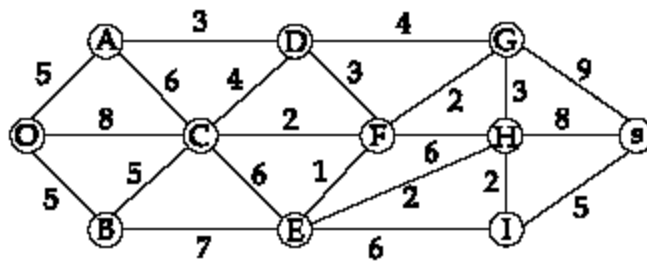
24. (a) Prove that a collection of all feasible solutions of a linear Programming Problem

Maximize $C^T X$

Subject to $AX \leq b$

$X \geq 0$

constitute a convex set.

(b) Use Vogal's Approximation Methods to Obtain an initial basic feasible solution of following Transportation problem, then find the optimal solution.

		To				
		D	E	F	G	Availability
	A	11	13	17	14	250
From	B	16	18	14	10	300
	C	21	24	13	10	400
Demand		200	225	275	250	

25. (a) Show that if X_Θ is a solution of the problem.

Minimization

Subject to $AX = b$

$X \geq 0$

Then $X_\Theta^T C X_\Theta$ is a monotonically increasing function of .

(b) Let $f(x)$ be a function of $X \in E_n$, which is differentiable with continuous partial derivatives and let the gradient vector in X be denoted by g (X). Show that the following are equivalent.

(i) $f(X)$ is convex

(ii) $f(X_2) - f(X_1) \geq g^T(X_1) (X_2 - X_1)$ for any two vectors $X_1, X_2 \in E_n$

(iii) $g^T (X + \lambda S).S$ is a monotonically non-decreasing as function of λ for any X and S

T denotes Transposition.

OR

Elective - IV

21. Distinguish between linear separability and linear independence.

22. Explain concept of feed forward Neural-network with an example.

23. Distinguish between supervised and unsupervised learning with suitable example.

24. What is meant by membership in a fuzzy set ? Illustrate triangular membership.

25. What do you mean by defuzzification ? Explain any two methods of defuzzification.

OR

Elective - V

21. Explain the significance of the repeat factor used in more. How do you search for the pattern include in a file and repeat the search ? What is the difference between this repeat command and the dot command ?

22. What types of variables are PATH and HOME ? Why are they called variables ? In what ways are they used ? What is sed ?

23. How is a client-server environment created in X ? What is xterm ?

24. (a) Explain three command line options handed by X Client.

    (b) Explain dtfile, xbiff, xload.

25. (a) Explain Terminal Emulator under X Windows.

    (b) Explain xclipboard.

SECTION - IV

Note : This section consists of one question carrying (40) marks.

(40x1=40 marks)

26. (a) Write the conceptual dependency diagram for following sentence.

    "Thomas had given a ring to Mary".

    (b) Solve the following using state space representation :

    You are given two jugs, a 4 liter one and a 3 liter one. Neither has any measuring marks on it. There is a pump that can be used to fill jug with petrol. How can you get exactly 2 liter of petrol in to 4 liter jug ?

OR

    (a) State the 8 queen's problem and solve it by using backtracking.

    (b) A binary tree is stored in memory. Write a recursive procedure which finds the number of nodes in the binary tree.

OR

    (a) Construct SLR parser for the following grammar.

    $$E \rightarrow E + T, \quad E \rightarrow T$$
    $$T \rightarrow T * F, \quad T \rightarrow F$$
    $$F \rightarrow \underline{id}$$

    Is the following grammar is LL(1) grammar ? Justify your answer.

    $S \rightarrow AA$

    $A \quad bA/d$