

Computer Science and Applications
Paper III

Time Allowed : 2½ Hours]

[Maximum Marks : 200

Note :—This paper contains **19** questions arranged in four Sections, Sections I to IV. Section I contains *two* questions (Q. Nos. **1** and **2**) carrying **40** marks. Section II contains *three* questions (Q. Nos. **3**, **4** and **5**) carrying **45** marks. Section III contains *nine* questions (Q. Nos. **6** to **14**) carrying **90** marks and Section IV contains *five* questions (Q. Nos. **15** to **19**) carrying **25** marks.

SECTION I

Instructions :—This section contains *two* questions. (Q. Nos. **1** and **2**), each carrying **20** marks. You have to answer each question in about **500** words.

1. Illustrate the differences between BCNF and 3-Normal Form with an example.

Or

Draw state transition diagram for TCP. What are the various state transitions in client and server ? Briefly explain.

SECTION II

Instructions :—There are *three* questions (Q. No. **3**, **4** and **5**) to be answered in about **300** words each. The questions are based on the five electives/optionals. Select *one* of the elective/optional and answer all the *three* questions given below it. Each question is assigned **15** marks.

Elective I

3. Construct a 2-stack machine that accepts the language $\{a^m b^n c^{m-n} \mid m \geq n\}$.
4. Construct a non-deterministic finite automaton for the regular expression $(a+b) + (b+c)^*abb$. Find equivalent DFA and minimize the resultant DFA.
5. Design Turing Machine to compute the function $f(x, y) = x - y$. Input is encoded in unary string $x - y$, for example $11111 - 11 = 111$.

OR**Elective II**

3. Discuss the methods to estimate the degraded function in image restorations.
4. Describe the Lempel-Ziev coding and its applications.
5. Explain the properties of a code which is capable of detecting $2d + 1$ errors and correcting up to d errors.

OR**Elective III**

3. Using the Principle of Duality, solve the following optimization problem :
Minimize $G = 40y_1 + 24y_2$
Subject to ;

$$20y_1 + 50y_2 \geq 4800$$

$$80y_1 + 50y_2 \geq 7200$$

$$y_1, y_2 \geq 0$$
4. Explain with a simple example the North-West Corner Rule, Least Cost Method, and Vogel's Approximation Method for finding initial basic feasible solutions (use the same example).
5. Find a maximum flow and a minimum cut in the following network :

OR**Elective IV**

3. What is meant by supervised and unsupervised learning ? Give an example of each to elaborate their meanings.
4. Explain the terms local minima, global minima and momentum in neural networks with suitable diagrams/graphs.
5. Let $A = \{x_1, x_2\}$, $B = \{y_1, y_2\}$, and $C = \{z_1, z_2, z_3\}$ be three sets. Suppose that $R = \begin{bmatrix} 0.7 & 0.5 \\ 0.8 & 0.4 \end{bmatrix}$ and $S = \begin{bmatrix} 0.9 & 0.6 & 0.5 \\ 0.1 & 0.7 & 0.5 \end{bmatrix}$ are fuzzy relations on $A \times B$ and $B \times C$ respectively. Find the corresponding relation on $A \times C$ using max-min composition.

OR**Elective V**

3. (A) How was the original UNIX File System structured ?
(B) What are the principles used by the Berkley Fast File System, to improve the performance and reliability of the original UNIX file system ? Briefly explain them.
4. (A) What is Command Substitution in bash ? Give examples of two different mechanisms for Command Substitution. Name the login and logout scripts of *bash*.
(B) Write a shell script to create a user account whose particulars are to be accepted interactively. The data, along with their validation, to be provided are as follows :
 - (i) Account name-disallow duplicates
 - (ii) ID-disallow duplicates
 - (iii) Login Shell-check if the shell is available
 - (iv) Group membership-check if groups are available.
5. (A) What are OLE and ActiveX Controls ? Discuss different types of ActiveX control.
(B) What is ATL ? What are Smart Pointers ? Explain, with example, how do these help in client-side coding.

SECTION IV

Instructions :—This section contains **5** questions (Q. Nos. **15** to **19**) on a specific problem/information described in a passage. Each question carries **5** marks. You have to answer all the questions in about **30** words each.

Passage :

A simple graph is one which has at most one edge between any pair of nodes. A graph is k -regular when all the vertices are of degree k . A property P of simple graph is defined to be a monotonically increasing property (MIP) if the property is preserved when a new edge is added to a graph that already has this property. Similarly, a property P is a monotonically decreasing property (MDP) if it is preserved when an edge is removed from the graph.

- 15. Show that “Graph is a tree” is neither MIP nor MDP.

18. Define similar concepts MIP_v and MDP_v in terms of vertices.

19. Which of the MDP_v , MIP , MDP and MIP_v hold for the property “graph is regular”.

AUG - 37311/III

ROUGH WORK

AUG - 37311/III

ROUGH WORK

AUG - 37311/III

ROUGH WORK

AUG - 37311/III

ROUGH WORK