

(2½ hours)

Total Marks: 75

- N. B.:
- (1) All questions are compulsory.
 - (2) Make suitable assumptions wherever necessary and state the assumptions made.
 - (3) Answers to the same question must be written together.
 - (4) Numbers to the right indicate marks.
 - (5) Draw neat labeled diagrams wherever necessary.
 - (6) Use of Non-programmable calculators is allowed.

1. Attempt any three of the following: 15
 - a. What is data structure? Explain different categories of data structure.
 - b. List and explain different operations that can be performed on a data structure.
 - c. Define different asymptotic notations used to measure the complexity of an algorithm.
 - d. Discuss memory representation of one dimensional array. Differentiate between linear search and binary search.
 - e. Consider a two dimensional array D[3:7,-2:6]. If the base address of D is 5639 and each element takes 2 memory cells then find the address of D_{4,0} element assuming that
 - i. Array D is sorted in column major order.
 - ii. Array D is sorted in row major order.
 - f. What is sparse matrix? Explain different ways of representing sparse matrix into memory.

2. Attempt any three of the following: 15
 - a. Explain how memory is allocated and deallocated for linked list.
 - b. Write and explain an algorithm to insert a new element into sorted linked list.
 - c. Write and explain an algorithm to split a linked list into two linked lists.
 - d. Write and explain an algorithm to delete a node containing item from a doubly linked list.
 - e. What is header linked list? Explain different categories of header linked list.
 - f. Write algorithm to subtract two polynomials.

3. Attempt any three of the following: 15
 - a. Write and explain syntax verification algorithm.
 - b. Convert following infix expression into prefix and postfix expressions.
 - i. $a \times b \times (c - d) - (e^3 \times f) + g / h$
 - ii. $(a \times b \times c^2) + d - (c / d + e)$
 - c. What is recursion? What are disadvantages of recursion?
 - d. Write an algorithm to evaluate an arithmetic postfix expression and calculate the result of the expression. Give suitable example.
 - e. What is queue? How queue is represented in memory? Write and explain an algorithm to insert element into circular queue.
 - f. Explain with example priority queue.

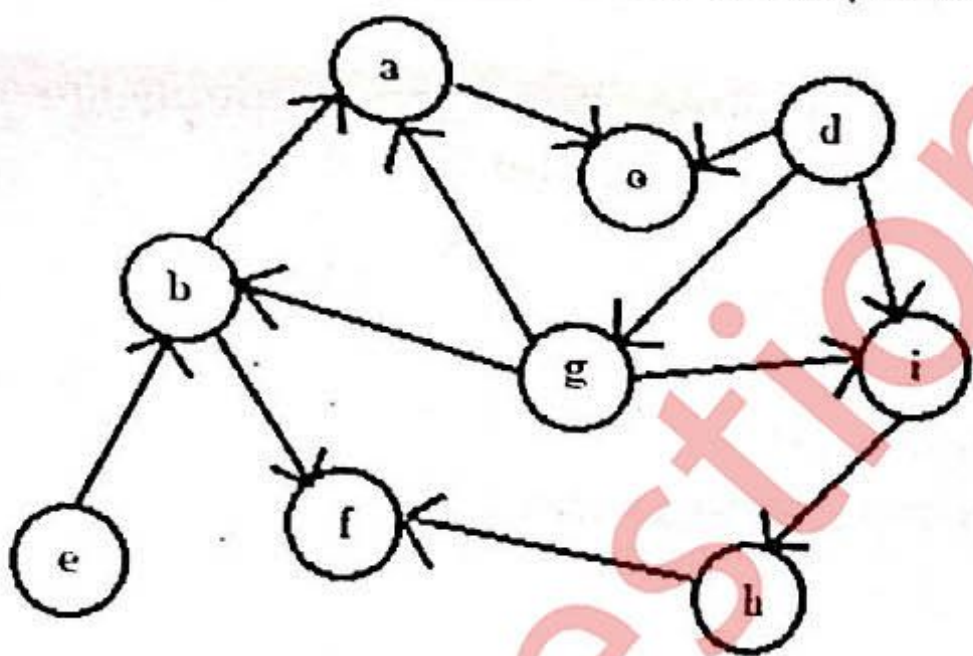
4. Attempt any three of the following: 15
 - a. Sort the following elements using merge sort.
23 56 13 34 78 62 98 53 49 82

[TURN OVER]

- b. Explain with example the following terms:
- Degree of a node
 - Path
 - Internal node
 - Similar binary trees
 - Complete binary tree
- c. Draw the binary tree whose inorder and preorder traversals are:
In-order : g d b h e i a f c
Pre-order : a b d g e h i c f
- d. Make a binary search tree by inserting the following numbers in sequence
52 36 98 29 123 39 15 56 31 365 278 45 72
- e. Draw max and min heap with the following elements
80 59 25 30 100 45 62 89 51 23 11 27 323
- f. What is AVL tree? How balancing is done in AVL tree? Explain with example.

5. Attempt any three of the following:

- a. Find the adjacency matrix and list representation of the following graph



- b. List graph traversal technique. Write and explain algorithm for any one. Give suitable example.
- c. Explain with example Dijkstra shortest path algorithm.
- d. Explain with example Prim's algorithm to find the Minimum Spanning Tree (MST).
- e. List different hashing methods. Explain with example any two of them.
- f. List different techniques of open addressing. Explain any one.