S0233 / S2039 / DATA STRUCTURES

Q. P. Code: 20936

(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. Discus 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 D4,0 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 x b x (c – d) – (e ^ 3 x f) + g / h
   ii. (a x b x 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:
   i. Degree of a node
   ii. Path
   iii. Internal node
   iv. Similar binary trees
   v. 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

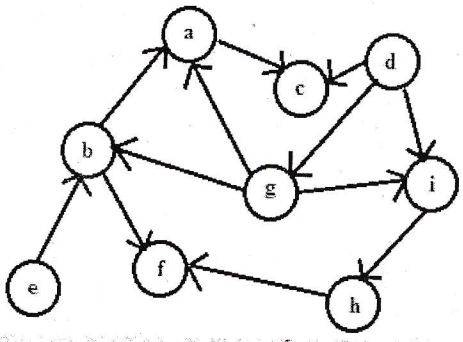
d. Make a binary search tree by inserting the following numbers in sequence
   52 36 98 29 123 39 15 56 31 365 278 45 72

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: **15**

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.
