VRK/KS/14/6646

Faculty of Engineering & Technology
Fourth Semester B.E. (Computer Science Engineering)
(C.B.S.) Examination
DATA STRUCTURE AND PROGRAM DESIGN
Paper—II

Time—Three Hours] [Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Due credit will be given to neatness and adequate dimensions.

(3) Assume suitable data wherever necessary.

1. (a) Answer the following questions :

    (i) Define data structure and write down the area where data structure is widely used.

    (ii) Explain Time and Space Complexity of an algorithm.

    (iii) What is an ADT ? Explain with suitable example.

    9

(b) Write an algorithm to perform binary search in a set of integer array and discuss its Best, Average and Worst case time complexity. 5

OR

2. (a) What do you mean by analysis of an algorithm ? Explain the different types asymptotic notations used in analysis of an algorithm. 7

   (b) Write down the intermediate steps of sorting the following array of elements using insertion sort and discuss Best and Worst case time complexity of insertion sort :

   $$A = 40, 50, 30, 85, 70, 65, 90 \qquad 7$$

3. (a) Consider a single linked list with a pointer pointing to its head. Write a 'C' function to :

   (i) insert a node to the front of the list,

   (ii) insert a node after the last node in the list,

   (iii) insert a node in between the lists. 9

   (b) What is static memory allocation and dynamic memory allocation ? What are the functions used for dynamic memory allocation in 'C' ? Give examples. 4

OR

4. (a) What is circular linked list ? Write an algorithm for inserting a node at the front of the circular linked list. 6

   (b) Give suitable representation for polynomials and write an algorithm to add two polynomials. 7

5. (a) Convert the following infix expression to postfix expression using stack. (Describe the stack at every stage) :

   $$(A + B * C) / (D - E) + F. \qquad 6$$

(b) Write Push and Pop algorithm to stack implementation. What is meant by the "stack overflow" condition ? Is it applicable to the linked list method of implementation of the stack ? Give reasons.   7

OR

6. (a) Explain the concept of multiple stack. How multiple stack can be implemented using array ? Give Push and Pop algorithm for multiple stack.   6

(b) What do you mean by Circular Queues ? Give the array implementation of it and write an algorithm for insertion and deletion of elements from the circular queue.   7

7. (a) What is a Binary Search Tree (BST) ? Make a BST for the following sequence of numbers :

55, 36, 70, 23, 89, 100, 58, 39, 41, 60, 65, 25

Write Preorder, Inorder and Postorder Traversal of this tree.   6

(b) The following keys are to be inserted in the order shown below into an AVL Tree :

8 12 9 11 7 6

Show how tree appear after each insertion.   4

(c) If we delete a node from BST and then insert the node again in BST, is the resulting BST necessarily the same as before ? Justify your answer.   3

OR

8. (a) What is the difference between a binary tree and a binary search tree ? Give an example of tree that is binary tree but not a binary search tree.   4

(b) Using the following Traversals, construct the corresponding binary tree and write Post-order traversal :

INORDER   : H K D B I L E A F C M J G

PREORDER : A B D H K E I L C F G J M

6

(c) What do you mean by threaded binary tree ? Give example.   3

9. (a) Define graph. When is a graph said to be directed ? Differentiate between a strongly connected and weakly connected graph. Give an example in each case.

4

(b) What is a spanning tree ? Does the minimum spanning tree of a graph give the shortest distance between any 2 specified nodes ? Justify your answer.   4

(c) Construct the Minimum Cost Spanning Tree (MST) of the following graph using Prim's algorithm :   6
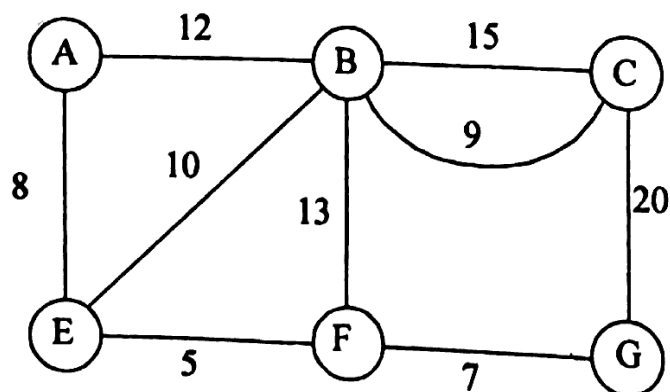
OR

10. (a) Answer the following :

   (i) What do you mean by Graph traversal ?

   (ii) Define Depth First Search (DFS) of a graph. Write a non-recursive algorithm of Depth First Traversal.

   (iii) Compare and contrast : DFS and BFS (Breadth First Search) with suitable example. 1+4+3=8

   (b) Explain the following :

   (i) Shortest Path Problem (Single source all pair)

   (ii) Hamilton Path. 6

11. (a) Given the following list of elements 25, 26, 89, 45, 12, 32, 90, 55, 69, 96 and the hash function : (Index = key %10). Show the hash table. Use Collision Resolution through linear probing. 7

   (b) What is symbol table ? What is the use of symbol táble ? Describe the implementation of symbol table.

   6

OR

12. (a) What a collision in hashing ? How can it be avoided ? What are the different collision handling mechanisms ? Explain each with suitable example.

   7

   (b) What do you mean by hashing ? Explain different techniques used in hashing with suitable example.

   6