Algorithms & Data Structure Paper - III

P. Pages : 3

Time : Three Hours

TKN/KS/16/7387

||||| |||| ||||| |||| |||||
0483

Max. Marks : 80

_____

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data wherever necessary.
10. Diagrams should be given wherever necessary.
11. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Define algorithm. Enlist and explain about the essential characteristics of an algorithm. **6**

b) Write recursive functions in C for. **8**
   i) Computation of the factorial of a number
   ii) Finding sum-of-digits of a n-digit number.

OR

2. a) What are asymptotic notations ? Elaborate with definitions, the Big-oh Notations, the theta notations and the Big Omega notations; giving behavioural representation of the functions $f(n)$ and $g(n)$ with respect to input n. **7**

b) Define data, data type and data structure. Elaborate on the classification of data structures. **7**

3. a) What do you understand by ADT ? Explain its significance. **3**

b) Write an algorithm (pseudocode) for **6**
   i) Inserting an element in the stack
   ii) Removing an element from the stack

c) Convert an arithmetic expression, $A*(B+C*D)-F$ into its equivalent postfix form. Show the contents of the stack during the conversion process. **4**

OR

4. a) Differentiate between a stack and a queue ADT. Give minimum 5 points of difference. **4**

b) Write an algorithm (pseudocode) for **6**
   i) Adding an element to the queue
   ii) Deleting an element from the queue

c) Write a note on double-ended queue (deque) **3**

5. a) What do you understand by dynamic memory management ? Enlist and explain the advantages of linked lists. **5**

b) Write algorithms (pseudocode) or C-program to perform following operations on a singly linked linear list. **8**
   i)   Adding a node at the beginning of the list
   ii) Deleting a node from the end of the list

OR

6. a) Write a C-program to create a linked linear list. The user inputs the number of nodes in the list and values for information content of each node. You must also show the contents of the singly linked linear list after creation. **9**

b) Write an algorithm to compute the length of a singly linked linear list. **4**

7. a) With suitable example define the following. **6**
   i)   A tree   ii) A forest
   iii) Degree of a node   iv) Depth of a tree

b) Write recursive algorithms to implement. **6**
   i)   Post-order traversal of a binary tree
   ii) Inorder traversal of a binary tree

c) For the following preorder traversal of a tree construct the original binary tree. **2**
   $* + - ABC - +DEF$
   The inorder of the said tree is
   $A - B + C * D + E - F$

OR

8. a) Enlist the process of converting a general tree into the equivalent binary tree for the following tree, show the equivalent binary tree. **6**
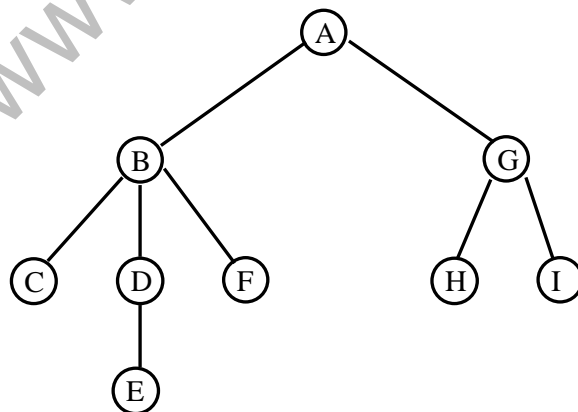

b) Define a Binary Search Tree. Write a algorithm to search a key in a BST, when the root of the BST is given as input alongwith the key to be searched. **5**

c) Write a note on B-Tree. Enlist advantages of B-tree over BST. **3**

9. a) Define a graph. Explain following terminologies in respect with a graph with examples. **7**
    i) Strongly connected and weakly connected graph.
    ii) In degree and out degree of a vertex.
    iii) A cycle and a loop

    b) With an algorithm to implement breadth-first traversal of a graph. Explain the process with suitable example. **6**

OR

10. a) What do you understand by a spanning tree ? Enlist properties of a minimum spanning tree. For the weighted given below, show the minimum spanning tree (show steps) **7**
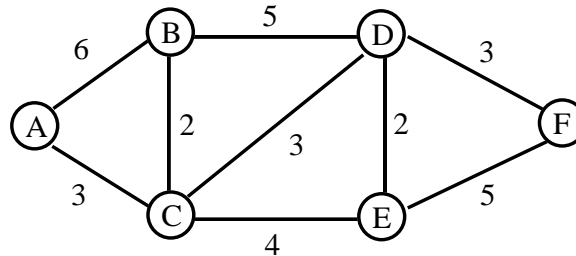
    b) Write and explain with suitable example the Dijkstra's shortest-path algorithm. **6**

11. a) For a list {66, 22, 88, 99, 33, 55, 44, 11}, arrange the list in ascending order using following techniques. **4+3**
    i) The Heap Sort
    ii) The shell sort
    Show the intermediate execution steps and exchanges mode.

    b) Differentiate between. **3+3**
    i) Linear search and binary search.
    ii) Division-remainder method and mid-square hashing method.

OR

12. a) Write an algorithm for locating an element using. **3+5**
    i) Linear search   ii) Binary search
    With suitable examples of each of the above.

    b) For a list {62, 21, 14, 97, 87, 78, 74, 85, 76, 45}, arrange the list in ascending order using Quick sort. Show clearly the execution steps and exchanges with pivot positions. **5**

****