2017

COMPUTER SCIENCE

(Major)

Paper : 3.1

(Data Structure and Algorithm)

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer : 1×7=7

(a) Which of the following is non-linear data structure?

(i) Tree

(ii) Array

(iii) Linked list

(iv) All of the above

(b) The complexity of binary search algorithm in worst case for an array of size n is

(i) $O(n)$

(ii) $O(\log n)$

(iii) $O(n^2)$

(iv) $O(n \log n)$

(c) The complexity of merge sort algorithm in best case for an array of size n is

(i) $O(n)$

(ii) $O(\log n)$

(iii) $O(n^2)$

(iv) $O(n \log n)$

(d) The operation of processing each element in the list is known as

(i) traversal

(ii) inserting

(iii) merging

(iv) sorting

(e) Which one of the following is also known as preorder traversal?

(i) LNR

(ii) RLN

(iii) RNL

(iv) NLR

(f) A stack is also known as

(i) first in, first out

(ii) last in, first out

(iii) last in, last out

(iv) first in, last out

(g) How many nodes does a complete binary tree of level 5 have?

(i) 16

(ii) 15

(iii) 32

(iv) 31

2. Answer the following questions : 2×4=8

(a) What is the difference between a stack and a queue?

(b) Differentiate linear data structure from non-linear data structure.

(c) Define Big-O notation.

(d) Define optimal binary search tree.

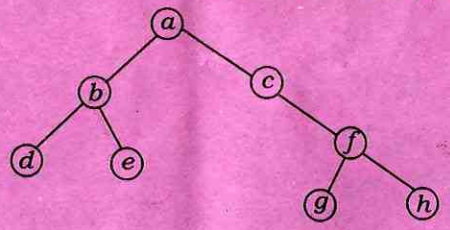
3. Answer any *three* from the following questions : 5×3=15

(a) Define space and time complexity. What is the best-case time complexity of quick-sort?

(b) Sort the following sequence of integers by implementing quicksort algorithm. Show all the intermediate steps :

2, 8, 7, 1, 3, 5, 6, 4

(c) Write down the in,.order, preorder and postorder traversals of the following tree :



(d) Write an algorithm for applying BFS on a binary tree.

(e) Write a function to insert a node in a singly linked list at a given position.

4. Answer any *three* from the following questions : 10×3=30

(a) Write a computer program or an algorithm to implement a queue using a circular linked list.

(b) Explain the algorithm for bubble sort using a suitable example. Compute the best-case and worst-case complexities of bubble sort.

(c) Construct a binary search tree for the following data. Show the tree at each step :

34, 91, 30, 31, 82, 86, 140

Write the functions for inserting an element into a binary search tree and for searching an element in a binary search tree.

(d) Convert the following infix expression to postfix expression. Show the stack contents at each step :

$A * (B + C) / D$

Give an algorithm to evaluate a given postfix expression.

(e) Write down a function to implement binary search algorithm. Demonstrate the same algorithm using a suitable example. Explain the advantages of binary search over linear search.

(f) What is doubly linked list? Write down the advantages of doubly linked list over a singly linked list. Write a function to insert an item into a sorted list of integers stored in a doubly linked list.

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