

Total No. of printed pages = 6

CS 131305

Roll No. of candidate

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2016

B. Tech 3rd Semester End-Term Examination
DATA STRUCTURE AND ALGORITHMS

Full Marks–100 Pass Marks–35 Time–Three hours

The figures in the margin indicate full marks
for the questions.

1. Define the following : 6×2=12
 - (a) Circular Queue
 - (b) Abstract data type
 - (c) Minimum spanning tree
 - (d) Sorting
 - (e) Traversal
 - (f) Articulation point.

2. Answer the following questions : 6×3=18
 - (a) When will a vertex of graph be called sink and source ? Describe with an example.

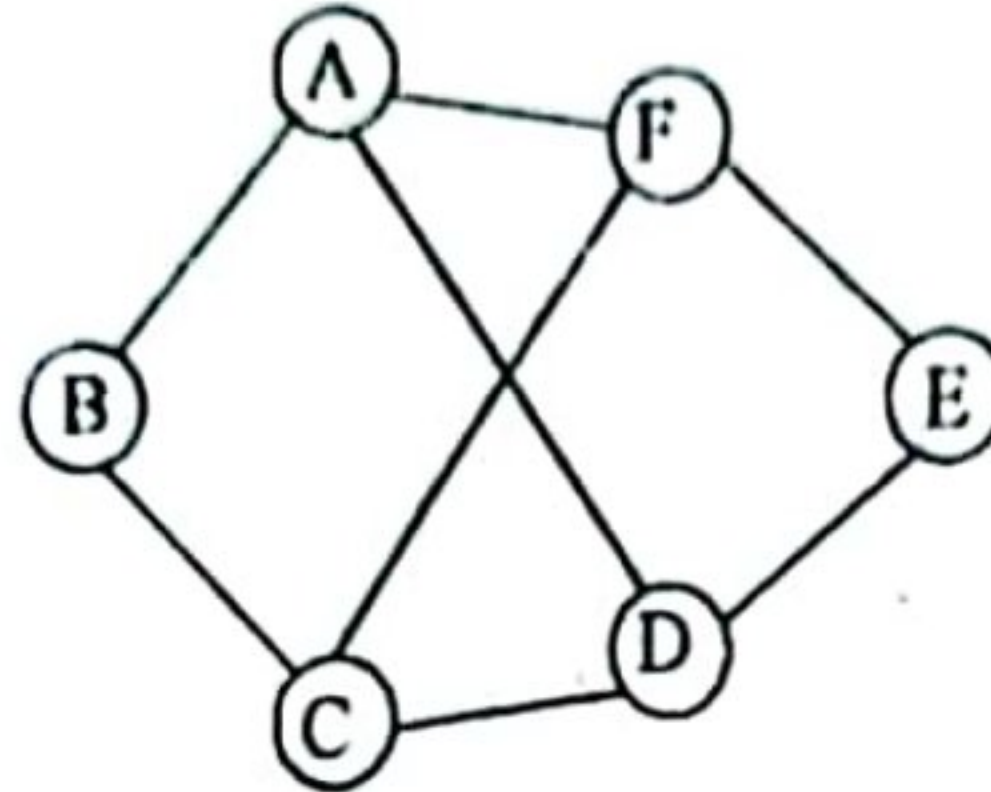
[Turn over

- (b) Write a function to reverse the direction of all the link of a single linked list.
- (c) What is the major disadvantage of Linear Queue and how it is overcome ?
- (d) Compare the best case time complexity of selection sort with insertion sort.
- (e) What is 'priority queue' ?
- (f) What is recursion ? Explain the different types of recursion.

3. Answer any *eight* of the following questions :
 $8 \times 5 = 40$

- (a) What is 'Double Ended Queue' ? What are the variations of 'Double Ended Queue' ?
- (b) Write an algorithm to insert an element 'ITEM' into a circular queue named "CQUEUE" whose size is "MAXLEN".
- (c) Write an algorithm or C-function to insert any node at any position of the Circular Link List.

- (d) Find out the adjacency Matrix and adjacency list of the following graph :



- (e) Discuss the Depth-First Search (DFS) algorithm with an example.
- (f) Choose the correct choice for the following :
- (i) Worst case complexity of the quick sort algorithm is :
- (a) $O(n \log_2 n)$
 - (b) $O(2n)$
 - (c) $O(\log_2 n)$
 - (d) $O(n^2)$.
- (ii) Hashing is a method of :
- (a) sorting
 - (b) searching
 - (c) inserting
 - (d) deleting.

(iii) Number of elements present in queue is :

- (a) $\text{Rear} + \text{Front} - 1$
- (b) $\text{Rear} - \text{Front} - 1$
- (c) $\text{Rear} - \text{Front} + 1$
- (d) $\text{Rear} + \text{Front}$.

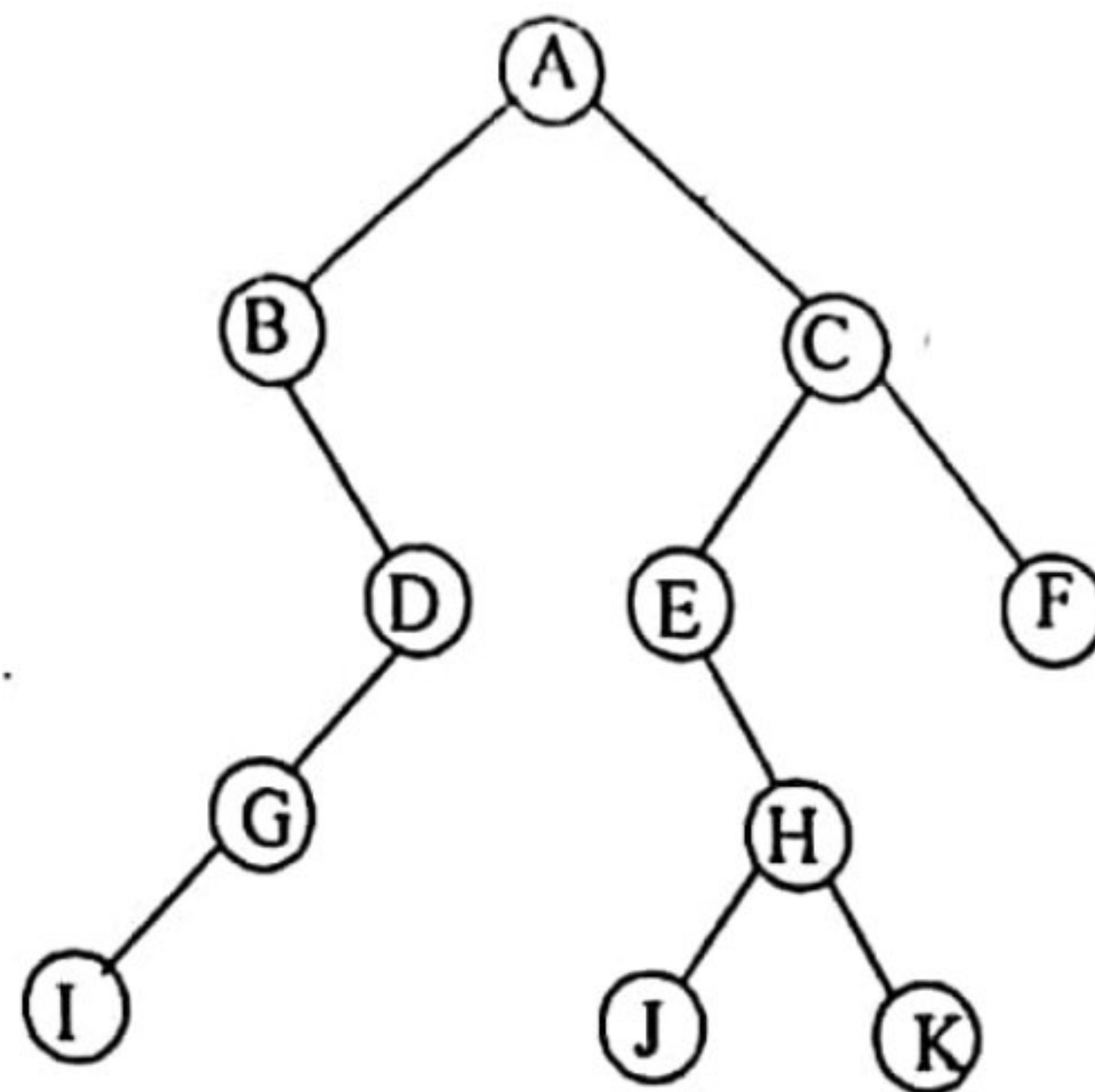
(iv) A balance factor in AVL tree is used to check :

- (a) what rotation to make
- (b) if all child nodes are at same level
- (c) when the last rotation occurred
- (d) if the tree is unbalanced.

(v) Binary search tree has best case run-time complexity of $O(\log n)$. What could the worst case ?

- (a) $O(n)$
- (b) $O(n^2)$
- (c) $O(\log_2 n)$
- (d) $2n - 1$.

- (g) What are the different binary tree traversals ?
Traverse the given binary tree using all the binary tree traversal methods.



- (h) Define the following terms : pendent node, clique, complete graph, weakly connected graph and isomorphism.
- (i) Write the Prim's algorithm and describe a suitable example.

4. Answer any *three* of the following questions :
 $3 \times 10 = 30$

- (a) What is an AVL tree ? Show the AVL tree that results after each of the integer keys 9, 27, 85, 55, 50, 45, 15, 2, 21 and 36 are inserted in that order, into an initially empty

AVL tree. Clearly show the tree that results after each insertion and make clear any rotations that must be performed.

- (b) Construct B-tree of order 3 and 4 with the following keys :

34, 12, 21, 3, 18, 67, 44, 87, 47, 54, 56, 17, 8, 30, 45, 5, 7,

After constructing the B-tree, delete the following nodes (data) : 18, 67, 54, 8, 45 and 5 from the constructed B-tree.

- (c) Write an algorithm for quick sort and sort the given sequence using quick sort. State the demerits of quick sort.

92, 45, 15 08, 35, 46, 44, 100.

- (d) Convert the following expression to infix expression using array. Write the required function or algorithm.

$AB + CD - * EF - GH + * /$