

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
**(END SEMESTER EXAMINATION)**

CLASS: BE  
BRANCH: CSE

SEMESTER : II  
SESSION : SP/13

SUBJECT: CS2301 FUNDAMENTALS OF DATA STRUCTURES

TIME: 3.00 HOURS

FULL MARKS: 60

**INSTRUCTIONS:**

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
  2. Candidates may attempt any 5 questions maximum of 60 marks.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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Q.1(a) Differentiate between the posterior and apriori methods of measuring the efficiency of an algorithm. Which one do you think is better and why? [2]

Q.1(b) Calculate the frequency count of the third line in the given program fragment [4]

```
A = 2n
For J = 1 to A
  For K = 3 to J
    M = M + 1
  End
END
```

Q.1(c) Examine the following function. What does it find? Also compute the running time complexity of the function. [6]

```
FUNCTION F(ARR,START,SIZE) /*ARR is an array of size SIZE with the first index being START */
  IF SIZE=1
    RETURN ARR[START]
  ELSE
    RETURN G(ARR[START],F(ARR,START+1,SIZE-1))
  END FUNCTION
```

```
FUNCTION G(A,B)
  IF A>=B RETURN A
  ELSE RETURN B
END FUNCTION
```

Q.2(a) Distinguish between row major and column major ordering of an array. Exemplify your answer with a suitable example. [2]

Q.2(b) For the following logical expression [4]

(a and b or c) or d or e or (not h)

Obtain equivalent postfix expression. Also, evaluate the post fix expression for a = true, b = false, c = true, d = true, e = true, h = false.

Q.2(c) What are the disadvantages of a linear queue? Write an algorithm to delete an element from a circular queue. Ensure that your algorithm performs proper underflow checking. [6]

Q.3(a) Draw a linked representation of a sparse matrix and explain your diagram. [2]

Q.3(b) What advantage is provided by using a doubly linked list? Illustrate your answer with a suitable example. [4]

Q.3(c) Write an algorithm to insert a node into a linked list so that the list always stays sorted. You can assume that the data in the list is made up of integers. [6]

Q.4(a) A binary tree T has 9 nodes. The inorder and preorder traversals of the tree are given as [2]

Inorder :- E,A,C,K,F,H,D,B,G

Preorder :- F,A,E,K,C,D,H,G,B

Draw the binary tree.

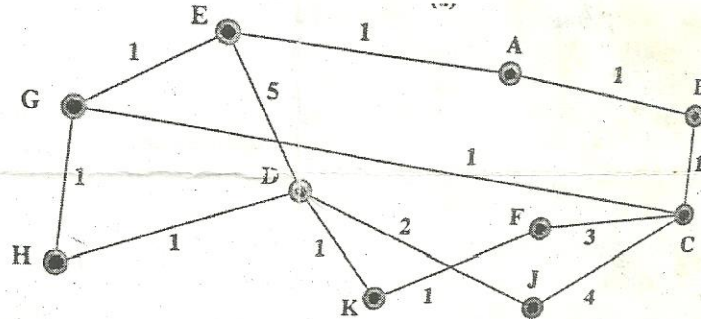
Q.4(b) The following integers are inserted into a AVL tree in the given order :- [4]

0,1,2,3,4,5,6,7,8,9

Draw the tree after the insertion of each element.

Q.4(c) Write a non recursive algorithm to find a given element DATA in a BST T. [6]

- Q.5(a) Define an Eulerian graph, and a Hamiltonian circuit. [2]  
 Q.5(b) Enumerate four different ways that graphs can be represented in computers. [4]  
 Q.5(c) State the Prim's algorithm to find the minimum cost spanning tree for a graph G. Use your algorithm to find the MST for the following graph : [6]



- Q.6(a) Differentiate between an internal and external sorting routine. [2]  
 Q.6(b) Trace the Shell Sort procedure on the unordered list  $L = \{24, 37, 46, 11, 85, 47, 33, 66, 22, 84, 95, 55, 14, 9, 76, 35\}$ . Use  $H = \{7, 5, 3, 1\}$  as your set of increments. [4]  
 Q.6(c) State a recursive version of the quicksort algorithm. What is the worst case performance of your algorithm? [6]
- Q.7(a) What is the best case and worst case running time complexity of a sequential search procedure on a sorted link list containing  $N$  nodes. [2]  
 Q.7(b) Describe the binary search algorithm and compute its running time complexity. [4]  
 Q.7(c) State the Interpolation search algorithm and explain in what way is it different from the sequential search algorithm. [6]