

[Answer any ten questions taking five from each group]

### Group A

Q1 Answer the following questions.

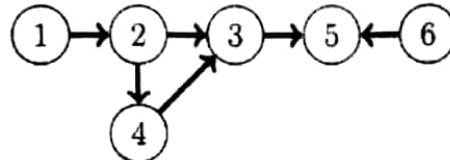
5x1=5

a) Find the following:

- DELETE('AAABBB', 3, 3)
- INDEX('STATES', 'TE')
- REPLACE('WE THE PEOPLE', 'WE', 'ALL')
- SUBSTRING('WE THE PEOPLE', 4, 8)
- INSERT('AAA', 2, 'BBB')

b) Find all possible Topological Orders for the following graph.

5



Q2 Consider the following queue of departments, where QUEUE is a circular array which allocated six memory cells (write Overflow or Underflow if they occur in any case):

FRONT = 2, REAR = 4 QUEUE: \_\_, MAT, CSE, BAN, \_\_, \_\_

5

Describe the queue as the following operations take place sequentially:

- BNG is Added
- ENG is Added
- Two items are Deleted
- MAT is Added
- CSE is Added

5

Describe the scenario step by step if the QUEUE is a normal one.

5

Q3 a) Write down the steps to evaluate a postfix expression.  
b) Consider the following postfix expression P. Evaluate P using the steps you described in (a). You need to show each step in a tabular form. (Ignore the commas, they are used as separator only)

5

P: 9, 3, 4, \*, 8, +, 4, /, -

Q4 a) Consider the following sorted linked list represented using two linear arrays INFO and NEXT.

Start	INFO	NEXT
3	1	4
	2	6
	3	8
	4	9
	5	1
Avail	6	10
5	7	0
	8	2
	9	7
	10	0
	23	

Answer the following questions:

- Redraw the given figure so that it represents the sorted linked list after inserting a node containing the value 15 in the INFO field.
- Redraw the given figure so that it represents the sorted linked list after deleting the node containing the value 19 in the INFO field.

b) Write the pseudocode of a recursive function to print the data in the links of a singly-linked list, in reverse order.

Q5 a) Write a pseudocode to compute F(M, N) where F(M, N) can be recursively defined as:

F(M, N) = 1 if M=0 or M≥N≥1

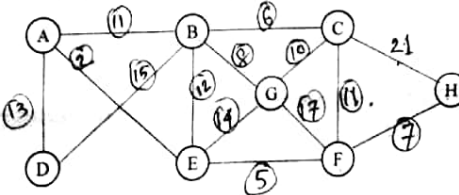
and F(M, N) = F(M-1, N) + F(M-1, N-1), otherwise

b) Write an algorithm to reverse a string using recursion.

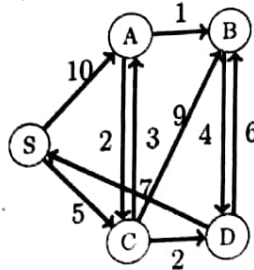
- ✓ Q6 Sort the following sequence of numbers in descending order using heap sort algorithm. Show all steps. 10  
 42, 34, 75, 23, 21, 18, 90, 67, 78
- ✓ Q7 Suppose that the following characters are given with their corresponding frequency (In Thousand): 10  
 e:9 f:5 d:16 a:45 c:12 b:13  
 Using Huffman's algorithm, find the code for each character. Compare the result of variable length code-word with fixed length code-word.

#### Group B

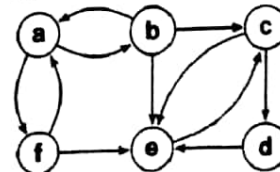
- ✓ Q1 Suppose the following list of letters is inserted in order into an empty binary search tree: 5  
 K, R, E, H, U, F, N, I, B, O, L 5
- ✓ a) Construct the Binary Search Tree. Show all steps. 5  
 b) Now Delete R from the tree and find the final tree. Show all steps.
- ✓ Q2 Construct an AVL search tree by inserting the following elements in the order of their occurrence. 10  
 67, 4, 17, 29, 16, 113, 101, 88  
 Show the steps with rotations.
- ✓ Q3 Let T be a binary tree with 9 nodes. The in-order and pre-order traversal of T yields the following sequences: 10  
 In-Order: E A C K F H D B G Pre-Order: F A E K C D H G B  
 Draw the tree T. Show the steps. 10
- ✓ Q4 Translate the infix expression to its equivalent postfix expression using stack. Show the steps using a table. 10  
 $(A - 2 * (B + C) \uparrow 3 / D * E) + F \uparrow G$
- ✓ Q5 Consider the weighted graph in the following figure. Apply Kruskal's algorithm to find out the minimum-cost spanning tree. Show the steps. 10



- ✓ Q6 Find the Shortest Distances of every nodes reachable from S using suitable algorithm. Show every steps. 10



- ✓ Q7 Find the strongly connected components of the following graph by showing each step. 10



2  
5  
6  
7  
8  
10  
11  
12  
13  
14  
15  
10  
19  
21

8 4 2 1  
1 0 1

32 16 8 4 2 1  
1 0 1 1 0 1