

Group – E

8. (a) Write the pseudo code of the algorithm for Merge Sort.
 (b) Sort the array given below using Quick Sort showing the value of the array elements in each pass:
 39, 9, 81, 45 90, 15, 27, 18.
 (c) Find the average case running time for selection sort.

5 + 5 + 2 = 12

9. (a) Write the algorithm of binary search.
 (b) Write short notes on hash table.
 Write the working principle of following hash function with example:
 Division method and Folding method.

3 + (3 + 6) = 12

**DATA STRUCTURE & BASIC ALGORITHMS
(CSEN 2004)****Time Allotted : 3 hrs****Full Marks : 70***Figures out of the right margin indicate full marks.**Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.**Candidates are required to give answer in their own words as far as practicable.***Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The number of swappings needed to sort the numbers 8,22,7,9,31,19,5,13 in ascending order, using bubble sort is
 (a) 11 (b) 12 (c) 13 (d) 14.
- (ii) The postfix equivalent of the prefix *, +,R,B,-,C,W is
 (a) RB + CW -* (b) RBCW + -*
 (c) RB + CW* - (d) RB + -CW*
- (iii) In the worst case, the number of comparisons needed to search a singly linked list of length n for a given element is
 (a) log₂n (b) n/2 (c) log₂n - 1 (d) n.
- (iv) void fun1(struct node* head){
 if(head == NULL)
 return;
 fun1(head->next);
 printf("%d ", head->data);
 }
 (a) Prints all nodes of linked lists
 (b) Prints all nodes of linked list in reverse order
 (c) Prints alternate nodes of linked list
 (d) Prints alternate nodes in reverse order.
- (v) The depth of a complete binary tree with n nodes is (log is to the base two)
 (a) log(n+1)-1 (b) log(n)
 (c) log(n-1)+1 (d) log(n)+1.
 Assume that the root is at depth 0.

- (vi) The minimum number of edges in a connected cyclic graph on n vertices is
 (a) n-1 (b) n (c) n+1 (d) none of the above.
- (vii) Which of the following sorting methods will be the best if number of swappings done, is the only measure of efficiency?
 (a) Bubble Sort (b) Selection Sort
 (c) Insertion Sort (d) Quick Sort.
- (viii) The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?
 (a) 2 (b) 3 (c) 4 (d) 6.
- (ix) The in-order and preorder traversal of a binary tree are d b e a f c g and a b d e c f g, respectively. The post-order traversal of the binary tree is
 (a) d e b f g c a. (b) e d b g f c a.
 (c) e d b f g c a. (d) d e f g b c a.
- (x) What is the maximum number of edges in an acyclic undirected graph with n vertices?
 (a) n-1 (b) n (c) n + 1 (d) 2n-1.

Group - B

- 2. (a) Define Abstract Data Type with example.
- (b) (i) Differentiate between Big O and Big Omega Notations.
 (ii) Distinguish between Row-major and Column-major representations with suitable examples.
- (c) Calculate Big-Oh notation for the function $F(n) = n(n+1)/2$
 $3 + (3 + 3) + 3 = 12$
- 3. (a) Write an algorithm to reverse single-linked list.
- (b) Write an algorithm to insert a node in kth position of double linked list.
- (c) What is upper triangular matrix? Give Example.
 How an upper triangular matrix is stored into computer memory?
 $4 + 4 + (2 + 2) = 12$

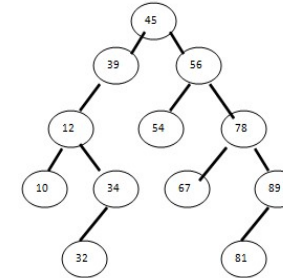
Group - C

- 4. (a) Write a pseudo-code to display all elements of circular queue.
- (b) Write the steps to Evaluate a postfix expression.

- (c) Calculate GCD of 2 numbers using recursion and show application of stack in this program.
 $4 + 4 + (2 + 2) = 12$
- 5. (a) What is an output restricted deque?
- (b) Given a queue with array implementation, write an algorithm for inserting an element in the queue. The algorithm should check for the overflow condition as well.
- (c) What is the disadvantage of linear queue? How circular queue resolve that problem?
 $2 + 6 + 4 = 12$

Group - D

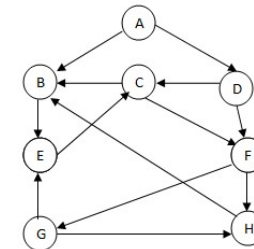
- 6. (a) Find out pre-order, post-order and in-order traversal of the given BST.



- (b) Create Binary Search tree with the input given below:
 98, 2, 48, 12, 56, 32, 4, 67, 23, 87, 23, 55, 46.
 (i) Insert 21, 39, 45, 14 and 54 into the tree.
 (ii) Delete values 23, 56, 2 and 45.

$3 + (3 + 3 + 3) = 12$

- 7. (a) For the given graph below find out adjacency matrix and adjacency list.



- (b) What do you mean by balance factor of height balance tree? Create an AVL tree using following sequence of data: 16, 27, 9, 11, 36, 54, 81, 63, 72.

$(3 + 3) + (1 + 5) = 12$