Course Code : CST 222 **KQLR/RS – 24 / 1510**

Third Semester B. Tech. (Computer Science and Engineering) Examination

DATA STRUCTURES

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Assume suitable data wherever necessary.
(2) Each question carries marks as indicated against them.
(3) Illustrate your answers wherever necessary with the help of neat sketches.

1. (a) Consider an Array ADT. Array should be declared as dynamic. Write a C-function as SUM_EVEN_ODD to find sum of all even elements and sum of all odd elements in an array. The calling function should receive both the result after the function call. The return type of the function is void. 5(CO1)

(b) Elaborate on the significance of time complexity of an algorithm. Determine time complexity for the following code segments using tabular method :

(i)
```
int Find_Sum(a[ ], n)
{
  if(n <= 0)
     return 0 ;
  else
     return (Find_Sum (a, n – 1) + a[n – 1]) ;
}
```

(ii)
```
Pseudocode : list_Sum(A, n)
             {
                total = 0
                for i = 0 to n – 1
                    sum = sum + A[i]
                return sum
             }
```
1+2+2=5(CO1)

2. (a) Demonstrate the steps to convert the following infix expression to postfix expression using stack as an intermediate data structure.
Infix Expression : ((a + b) * ((c – d) + e) / f – g) – k.

Evaluate the obtained postfix expression for a = 2, b = 3, c = 8, d = 3, e = 10, f = 5, g = 2 and k = 1. Show the contents (stack frame) at each stage of evaluation. 3+2=5(CO2)

(b) Write pseudo code for enqueue and dequeue any element for Circular Queue, for array based implementation. Consider circular queue of size 4 and show the trace of queue for following operations :—
dequeue( ), enqueue(15), enqueue(9), enqueue(5), enqueue(80), enqueue(1000), dequeue( ) enqueue(5500). 3+2=5(CO2)

3. (a) Let D_LIST is a doubly linked list in memory. Write a C function for the following :

(i) To find number of times a given data element called ITEM occurs in D_LIST.

(ii) To sort the list items from doubly linked list D_LIST.

(iii) To delete a node of any position from the doubly linked list. 2+5+3=10

4. (a) Write an iterative algorithm for post-order traversal of a rooted binary tree. Using your algorithm extract the postfix expression from of a binary tree represented as – (* (+ (A) (B)) (+ (E) (^ (C) (D)))). 5(CO3)

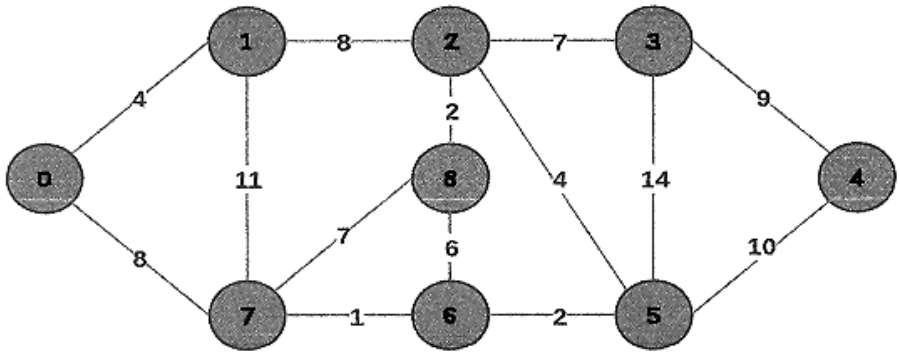
(b) What is AVL Tree and how is an AVL tree better than a binary search tree ? Construct AVL tree for the given sequence of keys 63, 9, 19, 27, 18, 108, 99, 81. Delete nodes 27 and 99 from the AVL tree formed after solving the above question. 5(CO3)

OR

(c) Construct a Binary Search Tree for the given sequence 18, 14, 25, 29, 13, 12, 24, 15, 10, 17. Show Binary search tree at each stage. Write a C function to print all the nodes level wise, for the constructed tree. Also discuss the time complexity of creating a binary search tree. Your C function should print the nodes of all levels in separate lines. 5(CO1,3)

5. (a) Differentiate between open hashing and closed hashing [minimum 4 points]. For the key – 54, 98, 34, 87, 29, 45, 29, 62, 37, 77 and 69, show the resulting hash table using open hashing with linear probing. Let $h(X) = X \% 11$. 5(CO3)

(b) Write Prim's algorithm to identify minimum spanning tree of an undirected graph. Trace the algorithm for the following graph and determine the minimum spanning tree.



5(CO3)

6. (a) Sort the given numbers in ascending order with the help of heap sort :

{96, 54, 74, 66, 48, 39}.

Show the pass-by-pass contents of array along with individual heaps after each number is placed at its correct position. 5(CO4)

OR

(b) Trace Shell sort procedure on the given keys : {15, 20, 36, 93, 12, 25, 22, 99, 85, 17} with a gap size of {5, 3, 1}. Also discuss the complexity of Shell sort. 5(CO1,4)

(c) Construct an algorithm for ascending order sequencing of a list using an insertion sort. Use this algorithm to order the list, L = {30, 60, 51, 40, 15, 95, 89}. Show step-by-step execution and comment on time complexity of the algorithm. 5(CO1,4)