Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Integrated Dual Degree (B.Tech and M.Tech)**
Sub_Code: 23ES1003

2nd Semester Regular Examination: 2023-24
SUBJECT: Programming in C and Data Structure
BRANCH(S):
AE,AERO,AME,BIOTECH,C&EE,CIVIL,CSE,CSEAI,CSEAIME,CSEDS,CSIT,CST,ECE,EEE,ELECTRICAL,ELECTRICAL & C.E,ETC,IT,MECH,METTA,MINERAL,MINING,MME
Time: 3 Hour
Max Marks: 100
Q.Code: P477

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define Data Structure. Differentiate between Linear and Non-Linear Data Structures.

b) Find the Output of the code:

```
main()
{
Int a[4] = {5,3,6,2};
Int i =3, j=0;
While(i)
{
        j+=a[i] ;
        i--;
}
Printf("%d", j);
}
```

c) Define a Sparse Matrix. Specify an Efficient Representation of Sparse Matrix.

d) Compute the maximum number of comparisons required to search an element in an ordered list of 2048 elements using Binary Search. Compare it with Linear Search.

e) Write the code to find the transpose of a matrix (2-Dimensional array)

f) Differentiate between a pointer to array and array of pointers.

g) Define a Queue. Specify the Conditions for a Circular Queue which is Full.

h) What is a Complete Binary Tree? Draw a complete binary tree of height 3.

i) What is the minimum and maximum number of passes required to sort an array of *n* numbers using bubble sort? Write the situation when it is minimum and when it is maximum.

j) Differentiate between call by value and call by reference.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Explain with example various types of if-else statements in C.

b) Given a linked list with elements 10, 20, 30, 40, 50. Write the steps to perform the following operations from the single linked list.

i) Deletion from the beginning

ii) Deletion from the end

c) Differentiate between structure and union with suitable example. Explain pointer to structure with example.

d) Construct a binary search tree from the list of given elements:

21, 30, 39, 4, 14, 28, 18, 15, 10, 48, 52

e) Differentiate between system defined and user defined functions with example.

f) Find the postfix and prefix of the following expression.

(a+b)*(c+d)/e/f$g

g) Differentiate linear and binary search. Let A is the array of the following elements. **A = {2, 4, 6, 8, 9, 10, 12, 13}**. Search the element **12** using binary search technique. Write its time complexity.

h) Discuss the advantage and average efficiency of quick sort. Apply Quick sort on the following data and show the contents of the array every pass:

48, 7, 26, 4, 13, 23, 98, 57, 10, 5, 32

i) Write a program in C to find the roots of a quadratic equation.

j) Write a program in C to print first 50 Fibonacci numbers.

k) Write a Program to reverse a String using Stack.

l) Write a Program to Insert an Element ***Num*** at a specified position ***pos*** in the Array ***A*** with ***N*** Elements.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** What do you mean by Array? Write a Program to merge two sorted arrays to a single sorted array. **(8)**

b) Write an Algorithm to convert an infix expression to postfix expression using a Stack. Convert the given Infix expression to Postfix using the specified algorithm: **(8)**

K + L - M*N + (O$P) * W/U/V * T + Q

Q4 **a)** What are the looping statements in C. Explain with suitable examples? **(8)**

b) Write a program in C to count the number of alphabets, digits, blank spaces, and special characters in a text. **(8)**

Q5 **a)** Write a function to calculate the factorial of a number and use this function to find combination of two numbers. c(n, r) = n!/r!(n-r)! **(8)**

b) Differentiate between static and dynamic memory allocation. Explain the use of malloc(), calloc(), and realloc() functions with example. **(8)**

Q6 **a)** Write a program in C to multiply two matrices A(mxn) and B(nxp) to generate a matrix of size C(mxp). **(8)**

b) What is circular queue? Write the insertion and deletion procedure in a circular queue. **(8)**