**Registration No :** | | | | | | | | | | |

**Total Number of Pages: 03**

**B.Tech /**
**Integrated Dual Degree (B.Tech and M.Tech)**
**RPL2B001**

**2nd Semester Regular/Back Examination: 2022-23**
**Programming For Problem Solving Using C**
**AERO, AE, AEIE, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CST, CSEAI, CSEDS, CSE, CSIT, CSEAIME, ELECTRICAL & C.E, EEE, ELECTRICAL, ECE, ETC, EIE, IT, MANUTECH, MECH, MME, METTA, MINERAL, MINING, PLASTIC**

**Time : 3 Hours**
**Max Marks : 100**
**Q.Code : M246**

**Answer Question No.1 (Part-1) which is compulsory, a ny 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)** Mention three main purposes of an operating system?

**b)** Represent the following C code using flow chart.
if (a>b) printf("a>b");
else printf("a<b");

**c)** What is the ternary operator? Write its syntax and the actual code that it means.

**d)** Differentiate between compilation error and logical error.

**e)** Write the use of break statement with example.

**f)** Write a program segment to swap two variables without using a third variable.

**g)** What is dangling pointer in C?

**h)** Consider the following declaration of a 'two-dimensional array in C:
char a[100][100];
Assuming that the main memory is byte-addressable and that the array is stored starting from memory address 0. Find the address of a[40][50]?

**i)** Predict the output of below program:

```
#include <stdio.h>
int main()
{
   int arr[5];
   // Assume base address of arr is 2000 and size of integer is 32 bit
   printf("%u %u", arr, &arr[1]);
   return 0;
}
```

**j)** Write any three library functions to read from a file. If fopen() functions is not able to open a file, what does it returns?

## Part-II

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

**a)** Explain different type of operators used in C programming with suitable examples.

**b)** Write a C program to find the number of matching substrings in a string and print their position in the string.

Input: string= abbacccacbac, substring=bac

Output: number of matchings=2, positions=3, 10

**c)** An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of the total amount is charged. Write a C program to read the name of the user, number of units consumed and print out the charges.

**d)** Distinguish between entry-controlled loop and exit controlled loop with suitable examples. Write a program to find the sum of all prime numbers from 1 to n (taking n as user input).

**e)** Explain with suitable examples the scope, visibility, and lifetime of auto, external, static and register variables.

**f)** Write a C program to determine if a matrix is symmetric, skew-symmetric, or asymmetric.

**g)** Write a program in C to test a string whether palindrome or not.

**h)** Define a pointer? Discuss the declaration and initialization of the pointer variable. Define a function that uses pointers to take two matrices as input and returns their product.

**i)** What is a self-referential structure? Demonstrate the difference in usage of malloc() and calloc() functions for dynamic memory allocation. Write the C code to allocate space dynamically to a two-dimensional array of size 20 X 30.

**j)** Define a structure timeDuration that contains a time duration definition in hours, minutes, and seconds. Define a function timeAdder() that takes a list of durations and their number/size as input and calculates the total time elapsed. Use pointer arithmetic with pointers to structures.

**k)** Define a function binSearch() that performs iterative binary search on a given sorted array of integers. What is the time complexity and space complexity of binary search algorithm.

**l)** Write a C program to sort the elements of an unsorted array of integers using insertion sort algorithm. What is the worst-case and best-case time complexity of insertion sort algorithm.

## Part-III

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

**Q3** What is an array? Discuss different ways to declare and define one-dimensional and two-dimensional arrays with suitable examples. **(16)**
Write a C program to enter a matrix of order m X n then print the difference between sum of the elements of main diagonal and sum of the elements of first row of the matrix.

**Q4** Define function in C programming? Classify the user defined functions in C based on parameter passing and return type with suitable examples. **(16)**
Like Fibonacci, there exists a Tribonacci series where the n-th term is defined as:

T(n) = T(n-1) + T(n-2) + T(n-3), where T(0) = 0, T(1) = T(2) = 1
Define a recursive function that takes 'n' as user input and prints the n-th Tribonacci term.

**Q5** Differentiate between structure and union, with an appropriate example that demonstrates the storage of the data members. **(16)**

You are required to rank the students of a classroom based on their marks in a particular subject. Define a student structure containing the members – ID, Name, Marks, and Rank. Provide user input facility for 10 students' data (ID, Name, Marks). Give the rank values as per the student ranking in the class. Define functions to print the data as a table.

**Q6** Differentiate properly the various modes of opening a file in C programming. **(16)**

Write a C program to:

a) create a file to store sequentially a list of products with the data – ID, Name, Rate, Quantity
b) read the same file after creation and generate total bill amount.