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

**Total Number of Pages: 03** **Integrated Dual Degree (B.Tech and M.Tech)**
**Sub_Code: RPL2B001**

**2nd Semester Back Examination: 2023-24**
**SUBJECT: Programming For Problem Solving Using C**
**BRANCH(S):**
**AE,AEIE,AERO,AUTO,CHEM,CIVIL,CSE,CSEAI,CSEAIME,CSEDS,CSIT,CST,ECE,EEE,EIE,ELECTRICAL,ELECTRICAL&C.E,ETC,IT,MANUTECH,MECH,MINING,MME,PLASTIC**
**Time: 3 Hours**
**Max Marks: 100**
**Q.Code: P580**

**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)** Differentiate between compilation error and logical error with an example.

**b)** Briefly write about conditional operator with a suitable example.

**c)** Write a program segment to swap (interchange) two variables without using a third variable.

**d)** With proper justification, explain the output of the following code segment.

```
#include <stdio.h>
int main() {
char ch = 'X' ;
printf("%lu,%lu\n", sizeof(ch), sizeof('X') ) ;
return 0;
}
```

**e)** 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 + 1, &arr + 1);
   return 0;
}
```

**f)** Write the C code to allocate space dynamically to a two-dimensional array of size 20 X 30.

**g)** Explain the meaning of the following declaration.
int *fun (char*, int*) ;

**h)** Write the routine for insertion operation from the end of a singly linked list.

**i)** Give an example of a double linked list with 3 nodes. Mention tentative address of each node and fill the pointers accordingly.

**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)** An electricity board charges the following rates for the use of electricity: for the first 150 units Rs. 1 per unit; for the next 100 units Rs. 2 per unit; beyond 250 units Rs. 3 per unit. All users are charged a minimum of Rs. 75 as meter charge. If the total amount is more than Rs. 300, then an additional surcharge of 12.5% of the total amount is charged. Write a program to read the number of units consumed and print out the charges. Use single-line comments to denote the charge ranges.

**b)** What is recursion in C functions? Define a recursive function that takes input as number of terms 'n' and returns the n-th Fibonacci term.

**c)** Write a program to print the Pascal's triangle up to 'n' rows in pyramidal form as shown:

```
          1
        1   1
      1   2   1
    1   3   3   1
  1   4   6   4   1
```

Here 'n' is 5. Take 'n' as user input and use only main() function.

**d)** Write the program to find out value sin(x) using the following power series expansion up to accuracy 0.00001.

$\sin(x) = x - x^3/3! + x^5/5! - + \square\square\square$

Take the value of x as user input. $0 < x < 1$ (x is in radian).

**e)** Distinguish between Call by value and Call by reference with suitable example.

**f)** 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 matching=2, positions=3, 10

**g)** What is a structure? Define a structure called cricket that will describe the following information:

- player name
- team name
- batting average

Using cricket, declare an array player with 50 elements and write a program to read the information about all the 50 players and print a team-wise list containing names of players with their batting average.

**h)** Define string. List out all string manipulation functions. Explain any two with examples.

**i)** Write a C program to create a file to store sequentially a list of products with the data – ID, Name, Rate, and Quantity.

Read the same file after creation and generate total bill amount.

**j)** Write and explain insertion sort algorithm and find its time complexity.

**k)** Write a C program to implement merge sort.

**l)** Write a C program to implement the binary search. What is the time complexity of linear search and binary search?

## Part-III

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

**Q3** Write the syntax of different branching statements and explain their working with examples. **(16)**

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).

**Q4** What is an array? Discuss different ways to declare and define one-dimensional andtwo-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.

**Q5** 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.

**Q6** 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.