

Indian Statistical Institute

Course name: M.Tech(CS)-1st Year (2025-2026)

Subject: Introduction to Programming

Date 02.12.2025 Full Marks 80 Time: 3 Hrs

Answer all the questions

1. (a) Write the output of the following C program when executed and give reasons of such output.

```
#include <stdio.h>
int x =20;
int function1(int counter){
    x++;
    if (counter==0){
        return x;
    }
    x = x+counter--;
    return x;
}
int function2(int val){
    static int x = -5;
    x++;
    if (val==0){
        return x;
    }
    x = val--;
    return x;
}
int main (void) {
    int x=20;
    int i=0;
    printf("Output of Function_1 is: %d\n", function1(x));
    for (; i<10; i=i+2){
        x = function2(i);
        printf("Output of %d iteration is %d\n",i, x);
    }
}
```

- (b) Write down the differences between malloc and calloc functions in C. [2]
- (c) Write the algorithm of pop operation of stack using linked list. [5]
- (d) Given an Infix expression as follows, write down its postfix expression using stack. [5]
 $A+(B/C-(D*E^F)+G)*H$

2. Write a C program to find the sum of the following series for given values of x, y, n and k . Take these values as inputs.

$$1 - \frac{xy^n}{(k)} + \frac{x^2y^{n-1}}{(k-1) \times 2!} - \frac{x^3y^{n-2}}{(k-2) \times 2! \times 3!} + \frac{x^4y^{n-3}}{(k-3) \times 3! \times 4!} \\ + \dots \dots \dots + (-1)^k \frac{x^ky^{n-k+1}}{(k-1)! \times k!}$$

[10]

3. Given two strings (take as inputs) in lowercase characters. Write a C program to print the longest common substring (of consecutive characters) from these two strings. Print “not found” if there is no common substring.
 For example, if “station” and “applications” are two given strings then the longest common substring is “ation”. [10]
4. Write a C program to sort a given array using Quick sort technique. [10]
5. Write a C program to create a linked-list of N (take as input) nodes where data part of each node contains student name (string), age (integer) and marks in Computer (integer) and marks in Mathematics (integer) out of 100 marks in each subject. Also, print the name of the those students whose marks in Computer and Mathematics are either Prime or Fibonacci number. [12]
6. Given a 2D Array of integer elements. Write a C program so that value of each element of a position of the array will be the highest number obtained from the digits of the element of that position. For example, if the (i,j) th element of the array is 173. Then the output of the (i,j) th element will be 731. [10]
7. Given two linked-lists that contain integer data only and they are sorted. Write a C program to merge these sorted linked lists to form a single sorted linked list. [10]