

**Indian Statistical Institute
Computer Science I
First Year Students
19Mar2021**

Total Marks: 50

ANSWER Question 1 to 3 and either Question 4 or Question 5.

Question 1 [Total Marks: 10+5 = 15]

What will be the output of the following function?

Explain the output for the last 5 printfs , starting from printf("%d",a==b), and ignoring the printf("\n") in between.

```
#include <stdio.h>

int main()
{
    int a=1, b=2; float c=5.8, d=2.0;
    printf("%d",(a/b)); printf("\n");
    printf("%f",(float)(a/b)); printf("\n");
    printf("%f",(c/d)); printf("\n");
    printf("%d",(int)(c/d)); printf("\n");
    printf("%f",c/b); printf("\n");
    printf("%d",a==b) ;printf("\n");
    printf("%d",a=b); printf("\n");
    printf("%d",++a); printf("\n");
    printf("%d",a--); printf("\n");
    printf("%d",--a+b--); printf("\n");
    return 0;
```

```
}
```

Question 2 [Total Marks: 5+3+2=10]

What will be the output of the following program?

```
#include<stdio.h>

void foo(int n)
{
    if (n > 1)
        foo(n / 2);

    printf("%d", n % 2);
}

int main()
{
    foo(35);
}
```

Question 3 [Total Marks: 10]

Define a function that can take an integer array as parameter and use the function call in place of the comment in the code below that will generate a horizontal histogram as shown. PLEASE note you must produce the histogram by a function call so that it can work with another integer array.

```
#include<stdio.h>

//define a function to generate a horizontal histogram

void main ()

Int v[]=v={2,2,8,4,1}
```

```
/* write a block of code her to generate the histogram shown below*  
}
```

```
1 : xx  
2 : xx  
3 : xxxxxxxxx  
4 : xxxxx  
5 : x
```

Question 4 [Total Marks: 15]

Let a polynomial $P(x)$ of x with integer coefficients be represented by a linked list as follows:

Each node of the linked list represents a non zero term in the polynomial . Each node stores the power of x , and its (nonzero) coefficient. Each node points to the next nonzero term in the polynomial. For example, the polynomial $2x^4+5x+7$ is represented by 4, 2 -> 1, 5-> 0, 7 ->NULL with obvious notation.

Now do the following:

- Define a C structure for this linked list as well as pointer to it. (Use the above example as guide)
 - Write a C function that accepts a pointer to a linked list representing a polynomial and returns the degree of the polynomial (Use the convention that power of x in each node is greater than the power of x in the succeeding node as in the example above)
 - Write a C function that takes an integer n and a pointer to a linked list representing a $P(x)$ and modifies the linked list so that it represents the product of x^n and $P(x)$
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Question 5 [5+3+3+4=15]

a.) Describe a stack data structure and the standard functions related to stacks. [5]

b.) Below is a structure defining a stack implemented as an array.

```
// Data structure for stack containing integers
```

```
struct stack
```

```
{
```

```
    int maxsize; // define max capacity of stack
```

```
    int top; //set top to -1 for an empty stack
```

```
    int *array;
```

```
};
```

Write a C function that initializes an empty stack of capacity "maxsize". [3]

Write a C function that checks if the stack is empty.[3]

c.) Describe how a stack is used to evaluate a post fix expression. using an example like evaluation of $12\ 5\ 1\ * +\ 10\ -$ [4 marks]