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Roll No. 2394081.....

TCS-101

B. TECH. (FIRST SEMESTER) END SEMESTER

EXAMINATION, Dec., 2023

**FUNDAMENTALS OF COMPUTERS AND
INTRODUCTION TO PROGRAMMING**

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among
(a), (b) and (c) in each main question.

(iii) Total marks in each main question are
twenty.

(iv) Each sub-question carries 10 marks.

1. (a) Explain the Von Neumann architecture
with a neat sketch depicting the essential
units of a computer system.

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- (b) Draw a flow chart to generate prime numbers between a range (between R1 to R2) of numbers accepted from the user to the output screen.
 - (c) Write an algorithm to find whether a positive integer accepted from the user is Armstrong number or not. Validate the user is input for reading only positive integers.
2. (a) Discuss the use of ternary operator. Write a C program to find the biggest of three integers using a ternary operator.
- (b) Draw a flowchart and design a program in C to swap two integers read from the keyboard using bit-wise operators.
 - (c) Write short notes on the following :
 - (i) Features of C language
 - (ii) Special operators
 - (iii) Implicit Conversion Hierarchy
 - (iv) Switch case statement
3. (a) Design an algorithm and develop a C program to compute and print the sum of the following series :
- $$1 + (1 + 2) + (1 + 2 + 3) + (1 + 2 + 3 + 4) + \dots (1 + 2 + 3 \dots N)$$

4. (a) Illustrate with an example the compile time and run time initialization of 2-D arrays. Implement a C program using arrays to read N characters from the keyboard and then convert them into uppercase if in lowercase and vice-versa. Print the modified array to the console.
- (b) Write a C program to search an element using Binary Search algorithm. Read the N numbers and search Rev element from the user.
- (c) Design a C program to swap the elements about the principal diagonal of a square matrix of order $M \times M$. After swapping display all the elements of the matrix to the output screen.
5. (a) List the categories of user defined functions (UDF) based on their return types. Design a UDF that returns 1 if the integer is a Perfect number else returns 0 to the calling program.

(ii) #include <stdio.h>

void main()

{ int n=-1;

if(! n)

printf("%c", n + 10);

else

printf("%d",! n);

(iii) #include<stdio.h>

void main()

{ int False=4;

while(! False)

{

printf("World of C");

False _ _;

}

printf("%d", ! False);

}

(iv) #include<stdio.h>

void main()

{ int x[4]={0},y;

x[0]=2; x[1]=3;

for(; ! x[2];)

{ y=x[2] + 1;

printf("%d \n",y);

x[2]=y;

}

}

- (b) Differentiate between Entry controlled and Exit controlled loops with appropriate examples. Design a C program to find and display the square root of numbers read from the user. The program stops i.e., exits whenever the user types in a negative number.
- (c) Predict the output of the following code with proper justification of the same :

$$2\frac{1}{2} \times 4 = 10$$

Note : All the given C programs are free of syntax errors. Assume appropriate tokens if a missing.

- (i) #include <stdio.h>

```
void main()
```

```
{    char ch= '9';  
    ch=(ch-'0')+'A';  
    switch(ch)
```

```
{    case 70 :  
        case 71 :  
        case 72 :
```

```
        printf("%ch", ch + 2);
```

```
}
```

```
}
```

Display appropriate message in the calling program.

(For ex. $6 = 1 + 2 + 3 = 6$ is a perfect number as its sum of divisors equals the number itself).

- (b) Discuss the storage classes auto, register, static and extern with an appropriate snippet of C code for each.
- (c) Describe the memory layout of a C program and elaborate on different sections of its segments. Indicate which segment of the C memory block is used by dynamic memory allocation module.