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Indian Institute of Information Technology Guwahati
COMPUTER PROGRAMMING LAB (CS110)
ASSIGNMENTS-04

[Note: Do not use the scanf() function, switch-case, and/or do-while construct.]

1. Realize the output of the following program:

```
#include <stdio.h>

int main() {

    int n = 2;

    printf("Line: %d, n = %d\n", __LINE__, n);
    while(printf("Line: %d, n = %d\n", __LINE__, n), n) {
        printf("Line: %d, n = %d\n", __LINE__, n--);
    }
    printf("Line: %d, n = %d\n", __LINE__, n);

    return 0;
}
```

2. Realize the output of the following program:

```
#include <stdio.h>

int main() {

    int n = 2;

    printf("Line: %d, n = %d\n", __LINE__, n);
    while(n, printf("Line: %d, n = %d\n", __LINE__, n)) { //forever
        printf("Line: %d, n = %d\n", __LINE__, n--);
    }
    printf("Line: %d, n = %d\n", __LINE__, n);

    return 0;
}
```

3. Realize the output of the following program:

```

#include <stdio.h>

int main() {
    int n = 2;

    printf("Line: %d, n = %d\n", __LINE__, n);
    for (
        printf("Line: %d, n = %d\n", __LINE__, n);
        printf("Line: %d, n = %d\n", __LINE__, n), n;
        printf("Line: %d, n = %d\n", __LINE__, n), n--
    ) {
        printf("Line: %d, n = %d\n", __LINE__, n);
    }
    printf("Line: %d, n = %d\n", __LINE__, n);

    return 0;
}

```

4. Realize the output of the following program:

```

#include <stdio.h>

int main() {
    int n = 2;

    printf("Line: %d, n = %d\n", __LINE__, n);
    for (
        printf("Line: %d, n = %d\n", __LINE__, n);
        n, printf("Line: %d, n = %d\n", __LINE__, n);
        printf("Line: %d, n = %d\n", __LINE__, n), n--
    ) { //forever
        printf("Line: %d, n = %d\n", __LINE__, n);
    }
    printf("Line: %d, n = %d\n", __LINE__, n);

    return 0;
}

```

5. Write separate programs in C to print the following patterns. Each of them is associated with a control variable n . The examples are associated with $n = 4$.

i. ****

ii. #

#

#

#

iii. \$\$\$\$

\$\$\$\$
\$\$\$\$
\$\$\$\$

iv. ?
??
???
????

v. %
%%
%%?
%%??

vi. @@@@
@@@
@@
@

vii. &&&&
&&&
&&
&

viii. 1234
123
12
1

ix. 4321
321
21
1

x. 4
33
222
1111

xi. 0
01
012
0123

xii. For this, consider $n = 5$ unlike others.

1
23

```

456
7890
12345

```

```

xiii. 1
      1 2 3
      1 2 3 4 5
      1 2 3 4 5 6 7
      1 2 3 4 5
      1 2 3
      1

```

```

xiv. ****
      *
      *
      ****

```

```

xv. ****
     *  *
     *  *
     ****

```

```

xvi. <<<<(      )   >
     <<< ((      )) >>
     << (((      ))) >>>
     <  (((((((      ))))))>>>>

```

```

xvii. 1
      010
      10101
      0101010
      10101
      010
      1

```

6. Write separate programs in C to compute the sum of the first n terms of the following series:

i. $S_1 = 1 + \frac{1}{2} + \frac{1}{3} + \dots$

ii. $S_2 = 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \dots$

iii. $S_\pi = 4 \left(\frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots \right)$

iv. $S_{\log(1+x)} = x - \frac{x^2}{2} + \frac{x^3}{3} - \dots$

$$\begin{aligned}\text{v. } S_{e^x} &= 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots \\ \text{vi. } S_{\sin(x)} &= x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots \\ \text{vii. } S_{\cos(x)} &= 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots\end{aligned}$$

7. A cricket match is going on. The first five overs are done. The runs accumulated in these five overs are stored in five integers variables: r1, r2, r3, r4, and r5. Write a program in C to print a horizontal bar chart to show runs per over. If the values of these five variables are, respectively, 4, 2, 0, 10, 7, the chart needs to be as follows.

```
Over 1: ####
Over 2: ##
Over 3:
Over 4: #####
Over 5: #####
```

8. Write a program in C to find the least common multiple (LCM) of two numbers.
9. Write a program in C to find the greatest common divisor (GCD) of two numbers.
10. Write a program in C to count the number of digits in a number.
11. Write a program in C to print all even numbers between 1 – n , where n is a positive integer.
12. Write a program in C to print the multiplication table of any number.
13. Write a program in C to print the sum and product of digits of an integer.
14. Write a program in C to reverse a number.
15. Write a program in C to find whether a given positive integer is prime or not.
16. Write a program in C to print the prime numbers that are less than a given value n .
17. Write a program in C to find the factorial of a number.
18. Write a program in C to check whether a number is a Strong number or not.
19. Write a program in C to print the factors of a given number.
20. Write a program in C to print the Fibonacci series up to the first n terms.

21. Write a program in C to find x^n for a given positive real value x and a positive integer n .
22. Write a program in C to find whether a given number is odd or even. You cannot use the `?:` operator and the `if-else` construct.
23. Write a program in C to find if a year is a leap year. You cannot use `&&` operator, `||` operator, `?:` operator, `break`, `continue`, and any `if-else` construct.