বাংলাদেশ আর্মি ইন্টারন্যাশনাল ইউনিভার্সিটি অব সায়েন্স এন্ড টেকনোলজি, কুমিল্লা
BANGLADESH ARMY INTERNATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY (BAIUST), CUMILLA

Mid Term Examination, Spring 2025

Department of Computer Science and Engineering

Level-1 Term-II

Course Code: CSE 121

Course Title: Structured Programming Language

Credit Hour: 3.0

Exam Duration: 1 hour 30 Minutes

Full Marks: 90

Notes:

a. Figure on the right of each question indicates the marks for the respective question.

b. Course Learning Outcomes are-

CO1: Illustrate the fundamental concept of computer programming.

CO2: Explain various data types and operations in C.

CO3: Apply decision making and looping statements in problem solving.

CO4: Illustrate the advantages of using array and modular programming in problem solving.

CO5: Apply structured programming principles to implement structures, pointers, and dynamic memory allocation to optimize resource management and computational efficiency.

CO6: Explain different file operations on text and binary files.

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1. a. Predict the output of the following program. **[CO2→C4]** **[10]**

```
main() {
  int x = 1, y = 0, z = 1, t;
  for (t = 0; t < 10; ++t)
  {
    y += (x) ? z : -z;
    z++; x = !x;
  }
  printf("y = %d", y);
}
```

OR

```
int main( ) {
  int i, j, k = 0;
  j = 2 * 3 / 4 + 2.0 / 5 + 8 / 5;
  k -= --j;
  for (i = 0; i < 5; i++) {
    switch(i + k) {
      case 1:
      case 2: printf("\n%d", i + k);
      case 3: printf("\n%d", i + k);
      default: printf("\n%d", i + k);
    }
  }
}
```

b. Find output: **[CO2→C4]** **[10]**

```
int x = -2, y = 3, z = -4;
int sign = (x * y > 0) ? ((x * z > 0) ? 1 : -1) : ((y * z > 0) ? -1 : 1);
printf("Sign of the product: %d", sign);
```

c. Read the four values corresponding to the x and y axes of two points in the plane, p1 (x1, y1) and p2 (x2, y2) and calculate the distance between them, showing four decimal places, according to the formula: Distance = $\sqrt{(x2-x1)^2+(y2-y1)^2}$. **[CO2→C3]** **[10]**

2. a. The following is a part of a C-Program in which p,q are non-negative integers. **[10]**

```
int r,g;
if(q==0)
  g=p;
else{
  r = p % q;
  while( r != 0) {
    p = q;
    q = r;
    r = p % q;
  }
  g = q;
}
```

Describe the values of g when parameters are as given. [CO3→C4]
a. (p,q) = (2,3),
b. (p,q) = (6,0),
c. (p,q) = (0,9),
d. (p,q) = (6,15).

OR

Show the output that the following C program will generate: **[CO3→C4]**

```
int a=5, i, j=1, k;

for(i=1; i<=a; i++)
{
    for(k=0; k<i; k++)
    {
        printf("%d ", k+j);
    }
    printf("\n");
    j=k+j;
}
```

b. Illustrate a program that reads n integers from the user and counts how many of them are: Even, Odd, Positive and Negative numbers. **[CO3→C3]** **[10]**

Constraints:

1. Zero (0) should be counted as even, but not as positive or negative.
2. Your program should display the counts of each category.

Enter the number of elements: 7 Enter 7 integers: -3 0 4 7 -1 2 -6	Even numbers: 3 Odd numbers: 4 Positive numbers: 3 Negative numbers: 3

c. Write a C program that evaluates a quadratic expression of the form: **[10]**
$f(x) = ax^2 + bx + c$. **[CO3→C3]**

3. a. A number is beautiful if the sum of all of its divisors (except the number itself) is equal to the number. **[CO3→C3]** **[10]**

For example:
Sum of divisors of 28: 1+2+4+7+14=28
So, 28 is a beautiful number.

Now, write a C program that will read an integer from the user and print **YES** if the number is beautiful, else print **NO**.

b. Generate a program to print the pattern below. Taking n as input, print n lines that print the pattern. **[CO3→C4]** **[10]**

```
**********
****  ****
***    ***
**      **
*        *
```

OR

Sample input: 4
Sample output:
`-`
`+ +`
`- - -`
`+ + + +`
`- - -`
`+ +`
`-`
	Sample input: 5
	Sample output:
	`+`
	`- -`
	`+ + +`
	`- - - -`
	`+ + + + +`
	`- - - -`
	`+ + +`
	`- -`
	`+`

c. Given 4 numbers A, B, C and D. Print the last 2 digits from their Multiplication. [10]
[CO3→C3]

Sample input	Sample output:
5 7 2 4	80
1 1 1 1	01
0 0 0 0	00
10 10 10 10	00

Note:
The Multiplication of 4 numbers is **5 * 7 * 2 * 4 = 280**
So, the answer will be the last 2 digits which are **80**.

The Multiplication of 4 numbers is **1 * 1 * 1 * 1 = 1**
So, the answer will be the last 2 digits which are **01**.