# Bangladesh Army University of Science and Technology (BAUST), Saidpur

## *Department of Computer Science and Engineering (CSE)*

## *Final Examination, Winter 2024*

**Program: B.Sc. Engg. in CSE** **Course Code: CSE 1101 (Syl. 2021)** **Level- 1 Term- I**
**Time: 03 (Three) hours** **Credit: 3.00** **Full Marks: 180**
**Course Title: Structured Programming Language**

N.B.
- Symbols and abbreviations bear their standard meanings.
- Use separate answer script for each PART.
- Assume reasonable values for any missing data.

**PART- A (Marks: 90)**

(*Answer any three questions including Question No. 1*) Marks COs/CLOs

a) Summarize the rules for naming identifiers. In your answer, specify the following : What is the purpose of identifiers? Are uppercase letters equivalent to lowercase letters? Can digits be included in an identifier name? Can any special characters be included? How many characters can be included in an identifier name? Are all of these characters equally significant? (10) 1
Determine which of the following identifiers are valid. If invalid, explain why?

| | | | | |
|---|---|---|---|---|
| *amount* | *addition2value* | *_123_45_6789* | const | 'X' |
| *1record* | *Num1* | *main* | *file-3* | *$tax* |

b) Recognize the four different categories of bugs (errors) present in the following program. Revise the program to eliminate these bugs and make the code error-free. (10) 1

```
/* A simple C program to calculate Body Mass Index (BMI)=
weight / (height * height)  */

     #include <stdio.h>

     int main() {

         int w, h;

         printf("Enter your weight (kg) and height(m): ");
         scanf("%f%f", &w, h);

         bmi = w / pow(h , 3);

         printf("Your BMI is: %.2f\n", bmi);

         return 0;

     }
```

c) Discuss the compiling process (source file to executable format) of a C program with appropriate diagram. (10) 1

. a) Suppose, you are given two baskets, one basket is labelled as 10 number (busket_10) and another one is labelled as 20 number (busket_20). In label 10 basket, there is a ball which is labelled as number 20, and in another basket, label 10 number ball is present. Now, your task is to keep those two balls in those two baskets so that labels baskets and balls match. (10) 2

i) Write a C program for your assigned task.
ii) Write an alternative C program for this assigned task.

**Note:** You can rename your basket label number maintaining the rules but the balls label number are strictly maintained.

b) Write a C program that takes a character as input and prints out one of the following statements as appropriate: (10) 2
i) Vowel in capital letter
ii) Vowel in small letter
iii) Consonant in capital letter
iv) Consonant in small letter
v) Neither a vowel nor a consonant

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c) Discuss the trade-off between using an interpreted language versus a compiled language for a project. What factors would you consider when making this decision? (10)

3. a) Leap years are years where an extra day is added to the end of the shortest month, February. This so-called intercalary day, February 29, is commonly referred to as leap day. Leap years have 366 days instead of the usual 365 days and occur almost every four years. (10)

A leap year is exactly divisible by 4 except for century years (years ending with 00). The century year is a leap year only if it is perfectly divisible by 400. For example,

- 1999 is not a leap year
- 2000 is a leap year
- 2004 is a leap year

Write a C Program to check whether the year entered by the user is a leap year or not.

b) Write a switch statement that will examine the value of a char-type variable called color and print one of the following messages, depending on the character assigned to color. (10)

a) RED, if either r or R is assigned to color
b) GREEN, if either g or G is assigned to color
c) BLUE, if either b or B is assigned to color
d) BLACK, if color is assigned any other character

c) The Fibonacci sequence is a sequence where the next term is the sum of the previous two terms. The first two terms of the Fibonacci sequence are 0 followed by 1. Now, write a C Program to display the Fibonacci sequence of the first n numbers where n is a positive integer less than 100. (10)

4. a) Write the outputs of the following programs, if the input to the program is 0 (10)

```
int i,;
scanf("%d", &i);
++i;
i = 15;
printf("%d\n", i++);
printf("%d\n", i);
```

```
int i;
scanf("%d", &i);
if (++i) {int i = 36;
        int x= i--;
        printf("%d\n", x);
    }
printf("%d\n", i);
```

b) Explain the execution flow and output generation for any of the given C programs. Provide a step-by-step simulation, showing the values of loop variables (i, j, and k) and the variable x at each iteration. Analyze how the output is generated and illustrate the final result. (20)

```
int i, j, k, x = 0;
for (i = 0; i< 4; ++i)
for (j = 0; j < i+1; ++j)
{       k = (i + j - 1);
        if (k % 2 == 0)
             x += k;
        else if (k % 3 == 0)
             x += k + 2;
        printf("%d ", x);
}
printf ( "\n x = %d ",x) ;
```

```
int i, j, k, x = 0;
for (i = 0; i< 5; ++i)
for (j = 0; j < i; ++j) {
        switch (i+j - 1){
                case -1:
                case 0:
                x += 1;  break;
                case 1:
                case 2:
                case 3:
                x += 2; break;
                default :
                x += 3;
        }
        printf("%d ", x);
}
printf ("\n x = %d", x) ;
```

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## PART- B (Marks: 90)

*(Answer any three questions including Question No. 5)* Marks COs/CLOs

a) Consider the following Table 5(a) which contains a 1-dimensional array on the left and a 2-dimensional array on the right: (30) 2

Table 5(a): A 1 D Array (left) and a 2 D Array(Right)

| **1 Dimensional Array** | **2 Dimensional Array** |
|---|---|
| **[ 50, 40, 30, 10, 20 ]** | **1 2 3**<br>**4 5 6**<br>**7 8 9** |

Now, address the following tasks. Use functions and dynamic memory allocation where applicable.

i) Provide the syntax to create the specified arrays in memory.

ii) Sort the 1- dimensional array in ascending order, outlining each step separately.

iii) Write a C program to calculate the sum of the diagonal elements for the 2-dimensional array.

a) Suppose you're tasked with organizing information about students, which includes four attributes: an ID (a unique long integer), a name (a string), a gender (represented by a character), and a CGPA (a double-precision number). Follow these steps: (30) 3

i) Define a structure to represent this data, named 'StudentInfo.' Declare a structure variable 'student1' for this purpose. Examine the memory requirements of the 'StudentInfo' structure.

ii) If we choose to utilize a union to store this data instead, would it consume the same amount of memory? If not, please explain the rationale behind any differences.

iii) Declare a structure variable named 'student2' with the same attributes as described earlier. Initialize 'student2' with the following values during declaration: ID = 123456, name = "Alice Smith," gender = 'F,' and CGPA = 3.75.

iv) Declare a pointer to a 'StudentInfo' structure named 'ptr_student.' Assign the starting address of 'student1' to 'ptr_student' during the declaration.

v) Access any member within the 'StudentInfo' structure using both 'student1' and 'ptr_student.'

vi) Discuss the pros and cons of using structures versus unions for storing student information. Provide an example illustrating when one would be preferred over the other.

a) Explain the purpose of a function prototype. Interpret the significance of the function prototypes given below: (10) 3

i) `int sum(int a, int b);`

ii) `void swapValues(int *a, int *b);`

iii) `int findMax(int arr[], int size);`

iv) `double calAvg(double *values, int count);`

b) Discuss the limitations of fixed-size arrays in C. How can you overcome these limitations? Compare and contrast ***malloc***() with ***calloc***(). (10) 4

c) Develop a recursive function to determine and return the largest element in an array of integers. Avoid the use of loops, static or global variables, and use dynamic memory allocation. Ensure that the function prototype follows the format (10) 4

***int largest (int *x, int n);*** Here, x represents the array of integers, while n denotes the number of integers in the array.

Upon implementing the function, construct a basic main function to exemplify how you would initiate the initial call to the recursive function.

Sample Input: 10 2 5 7 8 9

Sample Output: The largest element is 10

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8. a) A C program contains the following declaration. (10)

```
int p[]= {10, 20, 30, 40, 50, 60, 70, 80}
int *x=p;
```

i) What is the meaning of x?
ii) What is the meaning of (x + 2)?
iii) What is the value of *x and *p?
iv) What is the value of (*x + 2)?
v) How do p[5], x[5] and * (x + 5) differ?

b) A palindromic string is a string (such as "MADAM") that remains the same when its characters are reversed. Now, write a C program to check whether a string is palindrome or not. (10)

c) Write a program in C that will read the content from an existing file (in.txt) and write the content to a new file (out.txt) and display the content on the screen as well. (10)

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