**UNIVERSITY OF SRI JAYEWARDENEPURA**

B.Sc. (General/Special) Degree First Year

First Semester Terminal Course Unit Examination – November 2022

**CSC 107 2.0 Introduction to Computer Programming**

**Duration: Two (02) hours**

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**Answer all questions.**

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**Question 1 (25 marks)**

(a) List five good practices in computer programming and explain how each help to improve the productivity of software development and the quality of software.

**[08 Marks]**

(b) Name and explain three (3) types of errors which can be found in computer programs.

**[05 Marks]**

(c) Write the outputs of the following C code segments.

i.
```
printf(" \"welcome \\to \nuwaraeliya\' " );
```

**[02 Marks]**

ii.
```
float a = 7 / 3 + 5 / 2 * 3 - 1 ;
printf(" %5.2f ", a );
```

**[02 Marks]**

iii.
```
int i = 1;
for ( ; i++ < 10; )
     if (i%2)
          printf(" %d ", i);
     else
          printf("\n");
```

[04 Marks]

iv.
```
int i=0, j=0;
for ( i=1; i<4; i++)
{
     for (j=i; j>0; j--)
          printf(" * ");
     printf("\n");
}
```

[04 Marks]

**Question 2 (25 marks)**

(a) ${}^{n}C_{r}$ represents the number of ways that **r** number of items can be selected from a given **n** number of items. Following equation is used to find the value of ${}^{n}C_{r}$.

$$ {}^{n}C_{r} = \frac{n!}{r!(n-r)!} $$

Where " **!** " is used to represents the factorial value of the respective number. Write a user define function named **nCr** to calculate and return the value of ${}^{n}C_{r}$ when **n** and **r** are passed as parameters. You may need to implement another function to find and return the factorial value of a given integer.

**[10 Marks]**

(b) Write a user-defined function to search a pattern in a given text. If the function finds the pattern, it should return the index of the text where the pattern starts. Otherwise, it should return -1. Use the following function prototype:

**int findPattern(char text[], char pattern[]);**

**[15 Marks]**

**Question 3 (25 marks)**

(a) The following C code is supposed to find and print the maximum of two integers. However, it does not compile and shows **10 errors**. Identify them and **rewrite** the correct code. Underline each correction clearly.

```
void maxOfTwo(int a[],int &b)

int main()
{
      int a = 10; b = 5;
      int max == MaxOfTwo( a, b );
      printf(" Max of %d & %d is %d ", a, b, max);
      return 0;
}

int maxOfTwo(int x, int y);
{
      if (x=<y)
            x = y;
}
```

**[10 Marks]**

(b) The following C code segments are compiling without any error messages. However, they do not provide the intended output when running. Identify those errors and rewrite the correct codes. Underline each correction clearly.

i. The following code is supposed to find and print the minimum of three integers.

```
int a=10, b=20, c=30, min;
if (a<b)
      if(a<c)
            min = a;
      else
            if (b<c)
                  min = b;
            else
                  min = c;
printf(" Min is %d", min);
```

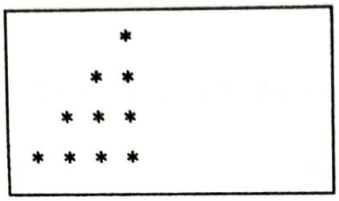
**[05 Marks]**

ii. The following user-defined function is supposed to swap the values of its arguments and return the updated values to the caller.

```
void swap (int a, int b)
{
      a = b;
      b = a;
}
```

**[05 Marks]**

iii. The following C code segment is supposed to print the triangle given below using asterisks and spaces.




```
int a, b, c;
for ( a=1; a<4; a++)
{
      for ( b=4; b>a; b--)
            printf(" ");
      for ( c=a; c<4; c++)
            printf(" * ");
}
```

**[05 Marks]**

**Question 4 (25 marks)**

A renewable energy company purchases excessive electricity from household roof-top solar energy producers during the daytime. At night, these houses can consume the electricity from the grid. Moreover, even during the daytime, if their production is not sufficient for their demand, the houses can consume their need from the grid. However, the electricity generation and the consumption are automatically read under three time slots namely, T1 (6am to 6pm), T2 (6pm-9pm), and T3 (9pm-6am). When preparing the bill, both electricity consumption and generation will be considered. If the total electricity generation is higher than the total electricity consumption of a house, the company will pay a fixed price of Rs

15.50 for each extra unit. Otherwise, the customer needs to pay for his/her excessive electricity consumption. Fixed rates of Rs 10, Rs 45, and Rs 25 per unit will be charged respectively for the time slots T1, T2, and T3. When calculating the payable units for each time slot, T1, T3, and T2 order will be considered (ascending order of unit rates).

*Eg: If the total electricity generation of the month is 250 units, and the total electricity consumption under three time slots are T1=50, T2=150, and T3=70;*

- Payable units for T1 period is 0 (T1 consumption < total generation) and remaining non payable units is 250-50=200
- Payable units for T3 period is 0 (T3 consumption < remaining non payable units) and remaining non payable units is 200-70=130
- Payable units for T2 period is 150-130=20 (T2 consumption > remaining non payable units)

If there are 1000 customers in the company under unique integer customer ID, write a C program to prepare their monthly electricity bills as described above. Your program should be easily updated to handle any number of customers. Use proper modularity and demonstrate good programming practices in your program. It is **not necessary** to write a menu driven program.

**A sample of the input screen and the final report are given below**

```
Enter customer ID          : 901
Enter total production     : 250
Enter T1 consomption       : 50
Enter T2 consomption       : 150
Enter T3 consomption       : 70
Do you want to add another (Y/N) ? : Y
```

**Electricity Bills**

| Customer ID | Production | T1 Charge | T2 Charge | T3 Charge | Total Charge |
|---|---|---|---|---|---|
| 100 | 190 | 0 | 180 | 200 | 380 |
| .... | .... | .... | .... | .... | .... |
| 901 | 250 | 0 | 900 | 0 | 900 |
| .... | .... | .... | .... | .... | .... |

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