

Module title	Programming 1 August Reassessment 2021
Academic term	2020-21
Year of study	Year 1
Semester	SEMESTER TWO

Programme code	Programme title	Module code
BN001	Higher Certificate in Engineering and Computer Engineering	ENG H1019
BN012	Bachelor of Engineering in Computer Engineering	ENG H1019
BN117	Bachelor of Engineering (Honours) in Computer Engineering in Mobile Systems	ENG H1019
BN009	Bachelor of Engineering in Mechatronics	ENG H1019
BN121	Bachelor of Engineering (Honours) in Mechatronics	ENG H1019
BN015	Bachelor of Engineering (Common)	ENG H1019
BN108	Bachelor of Engineering (Honours) (Common)	ENG H1019

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External Examiner(s): Dr. Martin Glavin, Dr. Simon Kelly

Instructions:

- Write C Programs to answer the programming Questions.
- Write written answers to answer the other questions in a word document, with each answer clearly numbered.
- Handwritten answers to programs and word questions may be uploaded if the student does not have access to a laptop.
- Zip up all files and upload to the submission link on Moodle in Section “August Assessment” before 23.59 on Sunday 15th August.

1. Write a program to create 4 integers and print their sum. Use four int variables integer1 to integer4 to store the four integers. Print out the sum of all four numbers entered. **(5 Marks)**

2. Write a program to accept two integer numbers from the user input and display their total, difference product and modulus. **(5 Marks)**

3. Write a C program that will calculate and display the volume of a cone, formatted to three decimal places, when the user enters the radius and the height of the cone.

Pay particular attention to the variable types used and the implementation of the volume calculation.

volume of cone = $\frac{1}{3} * \pi * r^2 * h$

(5 Marks)

4. Examine the following Arduino code and explain exactly what each of the 8 lines of code means.

```
#define LED 13  
void setup() {  
    pinMode(LED,OUTPUT);  
}  
void loop() {
```

```

digitalWrite(LED, HIGH);
delay(20);
digitalWrite(LED, LOW);
delay(20);
}

```

(5 Marks)

5. Rewrite the following code so as to use the **SWITCH** statement instead of the **if else if** statement as shown.

```

#include <stdio.h>
#include <stdlib.h>

int main()
{
    char status;
    status='S';
    if (status=='S')
        printf("Single\n");
    else if (status=='M')
        printf("Married\n");
    else if (status=='E')
        printf("Separated\n");
    else if (status=='D')
        printf("Divorced\n");
    return 0;
}

```

(5 Marks)

6. Rewrite the following code to include a for loop instead of a while loop. The output should be exactly the same.

```

int i,var=1;
i=1;
while(i<=5){
    var=var*i;
    printf("output %d answer = %d\n",i,var);
    i++;
}

```

(5 Marks)

7. The following macro definition computes the area of a triangle. Write a program to use such a macro to calculate the area of a triangle

```
#define TRI(base,height) (0.50 * base * height)
```

(5 Marks)

8. Write a program fragment that takes in a variable from the user, but will only take a value if it falls within the range 1-10 inclusive. The program must prompt the user if the value inputted is outside the indicated range.

(5 Marks)

9. (a) Write a program that accepts your first name and returns it to the screen ten times using only the character conversion specifier %c

(b) Write a program that accepts your first name and returns it to the screen ten times using only the string conversion specifier %s.

(10 Marks)

10. Write a program to calculate the BMI (Body Mass Index) using the following equation

$$\text{BMI}(\text{Kg/m}^2) = \text{weight (Kg)} / \text{Height (m}^2\text{)}$$

The program must ask the user to enter weight and height and outputs both the BMI Value and the classification category which is shown below.

Underweight BMI – up to and equal to 18.5

Normal Weight BMI – greater than 18.5 and up to and equal to 25

Overweight BMI- greater than 25 and up to and equal to 30

Obese BMI – BMI over 30.

(10 Marks)

11. Using an array to store the values, write a program that calculates the squares, cubes and square roots of the numbers from 0 to 10 and uses tabs to print the following table of values:

Number	Square	Cube	Root
0	0	0	0.00
1	1	1	1.00
2	4	8	1.41
3	9	27	1.73
4	16	64	2.00
5	25	125	2.24
6	36	216	2.45
7	49	343	2.65
8	64	512	2.83
9	81	729	3.00
10	100	1000	3.16

(10 Marks)

12. Using the math library functions, write a program to that accepts five values from the user and calculates the following statistical values:

Mean

Standard deviation (s)

$$\text{mean} = \frac{\sum_{i=1}^n x_i}{n}$$

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \text{mean})^2}{n-1}}$$

(10 Marks)

13. Write a program that uses a loop to output the values from 1 -10 using defined macros SQR and RECIPROCAL

```
#define SQR(x) ((x) * (x) )  
#define RECIPROCAL(x) (1.0/x)
```

(10 Marks)

14. Write a program that plays the game of 'guess the number' as follows:
Your program selects an integer random number in the range 1 to 10.
The program then types:

**I have a number between 1 and 10.
Can you guess my number?
Please type in your first guess.**

The player then types a first guess. The program responds with one of the following:

1. **Excellent! You guessed the number!**
2. **Too low. Try again.**
3. **Too high. Try again.**

(10 marks)