Programme Codes: TU856, TU857, TU858
Module Code: CMPU1025

# TECHNOLOGICAL UNIVERSITY DUBLIN

**CITY CAMPUS - GRANGEGORMAN**

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TU856 – BSc. (Honours) in Computer Science
TU857 – BSc. (Honours) in Computer Science (Infrastructure)
TU858 – BSc. (Honours) in Computer Science (International)

**Year 1**

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SEMESTER 2
EXAMINATIONS 2023/24

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# CMPU1025 PROGRAMMING

**Internal Examiners:**
Dr. Michael Collins
Dr. Paul Doyle

**Exam Duration: 3 Hours**

**Attempt ALL Questions in Section A and Section B**

## SECTION A
**(48 marks – Attempt ALL questions)**

**1. (a)** Correct the errors in the following C code segment:

```
int i = 0;

do
{
    printf("i is %d", i);
}
while(num < 10)
{
    i++;
}
```

(3 marks)

**(b)** Show what is displayed to standard output when the following C program is run:

```
#include <stdio.h>

int main()
{
     int num1 = 1;
     int num2 = 2;
     int num3, num4;


     num3 = ++num1;

     num4 = num2++ + --num3;

     printf("num3 is %d and num4 is %d", num3, num4);

     return 0;
}
```

(3 marks)

**(c)** Show how to display the following string to standard output using a `printf()` statement in C:

"Place a \ before the character 'n' in a printf() to move to a new line", she said.

(3 marks)

**(d)** What is the purpose of the switch statement in C?

(3 marks)

**(e)** Explain the following C code. Would you change anything?

```
int my_array[2][3] = {
                        1, 2, 3,
int i, j;               4, 5, 6
                      };
```

(3 marks)

**(f)** In C, explain the difference between *Pass by Value* and *Pass by Reference* when passing parameters using functions.

(3 marks)

**(g)** Show what is displayed to standard output when the following C program is run:

```
#include <stdio.h>

#define SIZE 5

int main()
{
     float my_array[SIZE] = {1};

     for(int i = 0; i < SIZE; i++)
     {
        printf("%.1f ", my_array[i]);
     }

     return 0;
}
```

(3 marks)

**(h)** Using the following C code:

```
float number = 10;
float *ptr;
```

Show the additional C code required to display the contents of the variable `number` to standard output by only using and dereferencing the pointer variable `ptr`.

(3 marks)

**(i)** In C, explain your understanding of the 'scope' of a variable?

(3 marks)

**(j)** Explain the bug in the following C code:

```
char* fxn()
{
     char my_char;


     my_char = 's';

     return &my_char;
}
```

(3 marks)

**(k)** In C, create a structure template for an individual. Each individual has a:

- first name (max 15 characters)
- age (whole number only)

(3 marks)

**(l)** In C, use the array below to enter five numbers and display the contents to standard output. In both cases, use pointer notation only.

```
float my_array[5];
```

(3 marks)

**(m)** In C, write the code to open a file called "file.txt" for appending.

(3 marks)

**(n)** What is the potential bug in the following C code segment:

```
char message[] = {'H','e','l','l','o'};

for(int i = 0; i < 5; i++)
{
     printf("%c", message[i]);
}
```

(3 marks)

**(o)** When developing a program in C, do you recommend using the `fputc()` or `fputs()` function to write a large amount of text to a file? Explain your answer.

(3 marks)

**(p)** Show what is displayed to standard output when the following C program is run:

```
#include <stdio.h>

void function(int);

int main()
{
     static int num = 1;

     for(int i = 0; i < 3; i++)
     {
          function(num);
     }

     return 0;
}


void function(int num)
{
     num++;

     printf("num is %d \n", num);
}
```

(3 marks)

## SECTION B
**(52 marks – Attempt ALL questions)**

**2.** You are a software architect for an IT company. You meet with a client to discuss their requirements for a software application that you will design and develop. The following is a part of the conversation:

*You*: What is the nature of your business and how can we assist?

*Client*: I am a dentist and run a small private dental practise in my hometown. I need a software application to allow me to enter the fee paid by each patient for their treatment. At the end of each business day, the application should calculate the (i) total fees paid, and (ii) average fee paid for that day.

*You*: How many patients do you see each day?

*Client*: It is different every day. I only know the exact the number of appointments scheduled at the start of the day.

*You*: Do you need the daily total & average fee paid each day to be permanently saved?

*Client*: Yes, if possible.

Using the above requirements, write a C program to:

**(a)** Given that the daily number of patient appointments is only known at the start of each day, your program should allow the dentist to enter the total number of patients with an appointment that day. Using this number, your program must allow the dentist to enter the fee paid by each patient that day using standard input.

(8 marks)

**(b)** Using the C program in part (a), extend the code to calculate and display to standard output the:

(i) total fees
(ii) average fee

paid by the patients at the close of business that day.

(10 marks)

**(c)** In order to permanently save the calculated (b)(i) total fees and (b)(ii) average fee paid at the close of business each day, extend your C code to write **both** amounts, i.e., the total fees and average fee paid that day, to a file called "fees.txt".

You may assume that the file is located in the same directory as the source code.

No validation (error-checking) is required.

(8 marks)

**3. (a)** Write a C program that asks the user to enter a string using standard input (the maximum characters allowed is 20). Your program should check if the string is a palindrome. A palindrome is any string that is spelled the same way backwards, e.g., "radar", "kayak", "rats live on no evil star".

If the string is a palindrome, display the word "yes" to standard output, otherwise display "no".

No validation (error-checking) is required.

(20 marks)

**(b)** Show how you would modify your program in part (a) to concatenate your string to the following string literal:

"You entered: "

(6 marks)