CMPU 1025

S211/106C

DUBLIN INSTITUTE OF TECHNOLOGY

KEVIN STREET, DUBLIN 8.

BSc. (Honours) Degree in Computing

Year 1

SEMESTER 2 EXAMINATIONS 2013/2014

PROGRAMMING

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Tuesday, 13th May 9.30 a.m. – 12.30 p.m.

Attempt **FOUR** questions.

SECTION A **MUST** be attempted.

Attempt any **THREE** questions in SECTION B.

SECTION A – 30 marks

SECTION B – 70 marks

SECTION A
(30 marks)

1. (a) What is wrong with the following code segment?

```
num1 = 2;
num2 = 5;

while (num1 < = num2);
{
    printf("Value of Num1 is: %d\n", num1);
}
```

(3 marks)

(b) Define an integer array that will store 12 numbers and using a loop, show how you can fill each element in the array with the numbers 1 to 12 in ascending order (i.e. value 1 in the first element, value 2 in the second, etc.,).

(3 marks)

(c) Show how to assign a symbolic name to a constant.

(3 marks)

(d) What is the purpose of the *indirection operator* as used in pointers?

(3 marks)

(e) Explain, with a small example for each, the use of the *puts()* and *gets()* functions.

(3 marks)

(f) Explain the difference between a programming compiler and interpreter.

(3 marks)

(g) Show the output of the following code segment:

```
char name1[] = "Michael";
char name2[] = "Mark";
char *name3 = "Patrick";
int len = 0;
len = strlen(name1);

printf("%d %d %d %d", strlen(name1), strlen (name2),
        strlen(name3), strlen("Rob"), len);
```

(3 marks)

(h) Using a `printf` statement, show how you would display the following sentence:

"The home drive is on the u:\ directory", he said.

(3 marks)

(i) What is wrong with the following code segment?

```
float distances[5];
int index;

for(index = 1; index <= 6; index++)
{
   printf("Enter the distance\n");
   scanf(&distances[index]);
}
```

(3 marks)

(j) What is the purpose of the `typedef` statement in C? Give an example of how it is used.

(3 marks)

SECTION B

(70 marks – Attempt THREE questions)

2. (a) Write programming statements in C to do the following:

i. Define two symbolic names called ROW and COL, both containing the value 2.
(2 marks)

ii. Declare a two-dimensional floating-point array called *matrix* using the symbolic names above.
(2 marks)

iii. Enter data into the array.
(6 marks)

iv. Calculate and display the average value of the data in the array.
(6 marks)

v. Write a function prototype to show how to pass such an array as a parameter and return a floating-point number.
(2 marks)

(b) Briefly answer each of the following short questions.

i. Explain one main difference between an executing program developed in C and the same program developed in Java?
ii. Explain how you may address the difference you identify in part (b)(i) above?
iii. Would you develop software for a real-time system (e.g. an automatic pilot system) using C/C++ or Java? Give reasons.
iv. What are the two ways of passing an argument to a function?
v. What is the maximum number of arguments that may be passed to a function?
vi. What does it mean when a variable is deemed 'local'?

(6 marks)

3. (a) Write a program that dynamically allocates memory for ten floating-point numbers. Using this memory, enter these ten numbers and display them on separate lines.
(15 marks)

(b) Write a separate piece of code to change the size of the memory block in part (3)(a) so that it can double the size (i.e., accommodate twenty floating-point numbers). Is there a reason why this might fail?
(8 marks)

4. The XXII Olympic Winter Games were held in Sochi, Russia in February 2014. You have been hired to develop the software for the Men's Downhill skiing event. In C, write a programme that uses Structures to do the following:

(a) Design a structure template for a skier's date of birth to contain the day, month and year.

(2 marks)

(b) Design a structure template that incorporates the structure template in part (a), i.e. a nested structure, for a skier's full details to include:

- First Name
- Surname
- Nationality
- Date of Birth
- Time to complete the downhill track (in seconds)

(4 marks)

(c) Using the structure template in part (b), write a program to do the following:

1. Create an array to store the details for 5 skiers in this event.

(2 marks)

2. Enter the details for all 5 skiers.

(10 marks)

3. Display the name of the skier who won the event (i.e. had the quickest time).

(5 marks)

5. (a) Answer the following short questions, using sample code where necessary:

i. What is the purpose of the NULL character in C?
ii. Explain a potential problem that might occur if the NULL character was not used where required in C.
iii. Is there a difference between 'A' and "A" in the C programming language?
iv. Show 2 ways of initialising the same string in main memory.
v. Explain the difference between using scanf("%s",...) and gets() when entering a string in a C program.

(10 marks)

(b) Write a program in C that asks the user to enter a string at least 20 characters in length. Your program must:

i. Count the number of vowels entered (a, e, i, o, u) and display the total number.
ii. Count the number of characters in the string and display this number.
iii. Enter a second string and check if it is identical to the original string.

(13 marks)

6. Write a program that calculates and displays all the prime numbers between 1 and 100 (inclusive).

A prime number is defined as a number that can only be divided evenly by itself and 1.

Examples of prime numbers include: 2, 3, 5, 7, 11, 13, 17, 19, etc.

(23 marks)