



Beijing-Dublin International College



SEMESTER II FINAL EXAMINATION - 2018/2019

School of Computer Science

COMP1002J Introduction to Programming 2

Dr. Rosemary Monahan
Prof. Pádraig Cunningham
Dr. Brett Becker *

Time Allowed: 120 minutes

Instructions for Candidates

Answers are to be supplied in this exam paper in the boxes provided below each question. Candidates should first complete their answers on rough paper then copy their final answers into the correct box. Candidates must complete all questions. The distribution of marks in the right margin shown as a percentage gives an approximate indication of the relative importance of each part of the question. In this exam, code is in `courier new` font and program output is **shaded**. Inputs to programs are ***italic bold***.

BJUT Student ID: _____ **UCD Student ID:** _____

I have read and clearly understand the Examination Rules of both Beijing University of Technology and University College Dublin. I am aware of the Punishment for Violating the Rules of Beijing University of Technology and/or University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I accept the punishment thereof.

Honesty Pledge: _____ **(Signature)**

Instructions for Invigilators

Calculators are not permitted. This is a closed-book exam.
Rough-work paper is to be provided for candidates.

Obtained score

Question 1:

a) Determine the output of the following code:

```
#include <stdio.h>
int main() {
    int size = 10;
    int half = size/2;
    int a[size];
    int c = 0;
    for(c; c < size; c++){
        a[c] = c*c;
    }
    int i=size/2;
    int temp=0;
    while(i<10){
        temp = a[i-half];
        a[i-half] = a[i];
        a[i] = temp;
        i = i + 1;
    }
    for(c = 0; c < size; c++)
        printf("%d ", a[c]);
}
```

[10 marks]

Answer for 1a:

--

b) Name three drawbacks (disadvantages) of arrays, and indicate which you think is most serious and why.

[10 marks]

Answer for 1b:

c) What is the output of the following code?

```
#include <stdio.h>
#include <stdbool.h>.
int main() {
    bool 0 = false;
    printf("%d\n", x); 0
    printf("%d\n", !x); 1
    printf("%d\n", x == false); 1
    printf("%d\n", true != false); 1
    printf("%d\n", true); 1
    printf("%d", false); 0
}
```

[10 marks]

Answer for 1c:

d) Write the output of the code below.

```
#include <stdio.h>

int main() {
    float f = 10.0;
    int i = (int) f;
    printf("i=%d\n", i);

    i = 12;
    f = (float) i;
    printf("f=%.2f\n", f);
}
```

[10 marks]

Answer for 1d:

i = 10
f = 12.00

e) Write **one** line of code to replace the line marked by // in the code below. This line of code should use pointer arithmetic so that the output of the code is:

2 4 6 8 10

```
#include <stdio.h>
int main() {
    int i = 0;
    int int_arr[5] = {1,2,3,4,5};
    int *p = int_arr;
    while (i < 5){
        //
        printf("%d ", int_arr[i]);
        i = i + 1;
    }
}
```

[10 marks]

Answer for 1e:

Question 1 total [50 marks]

Obtained score

Question 2:

Inspect the following code:

```
#include <stdio.h>
int main () {
    int arr[10] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
    int n = sizeof(arr);
    int i;
    for (i=0; i<n; i++)
        printf("%d, ", arr[i]);
    //twice(n, arr); //this line is for Question 2d
    printf("\n\n");
    for (i=0; i<n; i++)
        printf("%d, ", arr[i]);
}
```

The output of this code on a particular machine is:

```
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 40, 11, 6422300, 4042752, 6422368, 4198992, 1,
136568, 137136, 2, 0, 6422368, 1989049053, 4042752, 6422420, 4199093, 1, 0, 0,
0, 0, 0, 0, 1982358212, 4042752, 1982358176, -1765881113, 6422492, 2006912985,
4042752,
```

```
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 40, 11, 6422300, 4042752, 6422368, 4198992, 1,
136568, 137136, 2, 0, 6422368, 1989049053, 4042752, 6422420, 4199093, 1, 0, 0,
0, 0, 0, 0, 1982358212, 4042752, 1982358176, -1765881113, 6422492, 2006912985,
4042752,
```

There is **one** line of code that can be changed for the output to become:

```
1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
```

1, 2, 3, 4, 5, 6, 7, 8, 9, 10,

- a) Copy the line of code that needs to be changed into the answer box below, **without changing it**.

[2 marks]

Answer for 2a:

```
for (i = 0; i < n; i++)
```

- b) Now write the changed line of code into the answer box below. This line of code must contain `sizeof(arr)`.

[4 marks]

Answer for 2b:

```
for (i = 0; i < (n / sizeof(arr[i])); i++)
```

- c) Explain in English how the changed line of code works and why it fixed the program in 2a.

[7 marks]

Answer for 2c:

the operation of `sizeof( )` is to compute the byte.

if `int` size is 4 bytes

`arr[10]`

`sizeof(arr)` is 40 bytes.

but we need for loop to finish the `arr` member which is 10

(10 `int` in `arr` array).

When we print the bytes number for `arr`, we will access the variable which is not initialize.

when we change to `n/sizeof(arr[0])`
`sizeof(arr[0])` is a unit of one `arr` member.

d) Write a function called `twice`, so that when the line

```
//twice(n, arr); //this line is for Question 2d
```

is uncommented in the `fixed*` program, the output becomes:

```
1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
```

```
2, 4, 6, 8, 10, 12, 14, 16, 18, 20,
```

n / unit we can get the number of array member

This function should use a single for-loop and use pointer arithmetic to achieve the changes. **You only need to write the function called twice in the box below.**

**the fixed program is the program from 2a, with the fixed line of code from 2b.*

[12 marks]

Answer for 2d:

```
void twice ( int n , int arr[] ) {  
    for (int i=0 ; i < n/sizeof(arr[0]) ; i++) {  
        arr[i] = 2 * arr[i] ;  
    }  
}
```

Question 2 total [25 marks]

Obtained score

Question 3:

a) Inspect the code below. What are the values of a, b, and c at the line

//end?

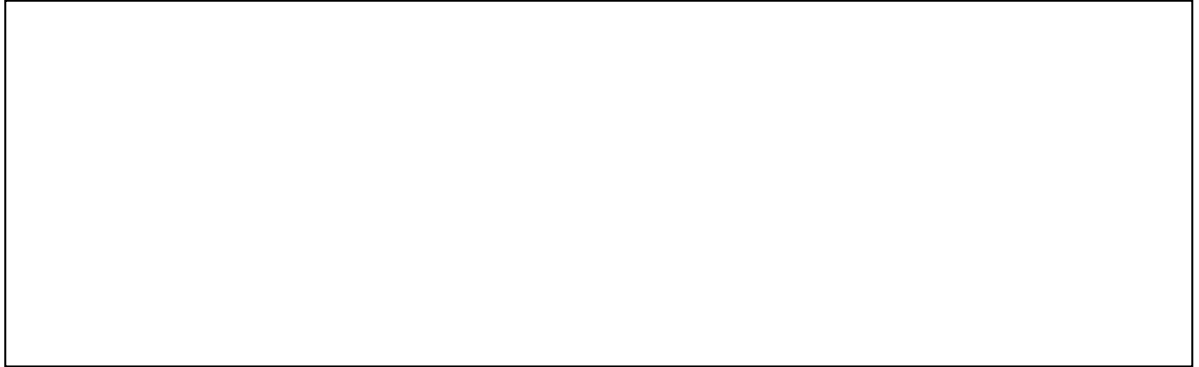
```
int a = 5;  
int b = a++;  
int c = ++a;
```

a=7
b=6
c=7

```
//end
```

[5 marks]

Answer for 3a:



- b) Write a complete C program that calculates the first n terms of the Fibonacci sequence. Example:

Enter the number of terms

5

The first 5 terms of the Fibonacci sequence are:

0, 1, 1, 2, 3,

[12 marks]

Answer for 3b:

```
# include <stdio.h>
int fibonacci (int n) {
    if (n == 0)
        return 0;
    else if (n == 1)
        return 1;
    else {
        return n fibonacci(n-1) + fibonacci(n-2);
    }
}
```

c) What is the output of the following code?

```
#include <stdio.h>
int main () {
    int a = 13, b = -9, i, *p = &a; // p is a pointer to int
    for (i=0; i<10; i++) {
        if ( *p > 0 ) {
            p = &b ;
        } else if ( *p < 0 ) {
            p = &a ;
        }
        *p = *p + 1 ;
    }
    printf ( "The value of a and b are: %d and %d \n", a, b);
}
```

[8 marks]

Answer for 3c:

Question 3 total [25 marks]