UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

COS1511
SECOND PAPER

May/June 2018

Introduction to Programming I

Duration 2 Hours

80 Marks

EXAMINERS

FIRST	MRS MP BUTHELEZI	MRS P LE ROUX
SECOND	MRS A MATHEW	

Closed book examination

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[TURN OVER]

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This examination question paper consists of 14 pages

INSTRUCTIONS:

1 Please answer all question in the answer book
2 Do all rough work in the answer book
3 Number your answers and label your rough work clearly
4 Marks are awarded for part of an answer, so do whatever you are able to in each question

ALL THE BEST!

[TURN OVER]

QUESTION 1 — 18 MARKS (9 MCQ, 2 marks each)

Write the letter of the choice that best completes the statement or answers the question next to the question number in your answer book

QUESTION 1.1

Suppose the following declarations appear in the main function of a C++ program

```
bool register,
char documents, paid,
int sNumber,
```

If the following function header is given

```
bool registerStudent(int sNumberP, char documentsP, char paidP)
```

which of the options below is a correct calling statement of the function registerStudent in the main function?

```
a bool registerStudent(sNumber, documents, paid),
b register = registerStudent(int sNumberP, char documentsP, char paidP),
c register = registerStudent(34345712, 'Y', 'N'),
d registerStudent(sNumber, 'N', 'Y'),
```

QUESTION 1.2

Suppose the following declarations appear in the main function of a C++ program

```
string dayOfWeek,
int productCode, number,
float discount,
```

If the following function header is given

```
void calcDiscount(float & discountP , int productCodeP,
                  int numberP, string dayOfWeekP),
```

which of the options below is a correct calling statement of the function calcDiscount in the main function?

```
a calcDiscount(discount, 676700, 12, productCode),
b calcDiscount(28 50, productCode, number, dayOfWeek),
c calcDiscount(21 00, productCode, 10, "Saturday"),
d calcDiscount(discount, 230067, number, "Friday"),
```

QUESTION 1.3

Suppose the following declarations appear in the `main` function of a C++ program

```
int number,
float cost, markup, discount,
```

Suppose the following calling statement appears in the `main` function

```
calcFinal(67 50, markup, discount, 5),
```

Which of the options below is a correct function header of the function `calcFinal`?

a
```
void calcFinal(costP, markupP, discountP, numberP)
```
b
```
void calcFinal(float costP, float & markupP, float discountP,
                                                    int numberP)
```
c
```
void calcFinal(float & costP, float markupP, float discountP,
                                                    int & numberP)
```
d
```
void calcFinal(float & costP, float & markupP, float & discountP,
                                                    int & numberP)
```

QUESTION 1.4

Consider the C++ code segment below What value will `newval` have after this code has been executed?

```
int var1 = 5,
int var2 = 10,
int newval,

if (var1 * 2 >= var2)
   newval = 5 + 2 * var2,
else if (var2 < var1)
       newval = var2 - var1 * 2,
     else
        newval = var1,
```

a 0
b 5
c 25
d 70

QUESTION 1.5

Suppose the input value for a is 5 What is the value of a after the following C++ code has been executed?

```
int a,
cin >> a,
switch (a)
{
     case 1   a += 3,
     case 3   a = a * 3, break,
     case 5   a = ++a + 10,
     case 6   a /= 2,
     default   a = a + 1,
}
```

a 9
b 16
c 15
d 8

QUESTION 1.6

Consider the following C++ code segment

```
int findValue(int numberP)
{
     int count = 0,
     int value = 20,

     while (count < numberP)
     {
               value += count,
          count ++,
     }
     return value,
}
```

What will be the output of the following statement executed in the main function?

```
cout << findValue(3),
```

a 3
b 13
c 22
d 23

QUESTION 1.7

What will be displayed on the screen by the following code?

```
int start = 0,
int count = 10,

while (start < count)
{
     cout << start << " , ",
     count++,
}
```

a 0 , 0 , 0 , 0 , 0 , (i e the next value will be 0 followed by , and so forth)

b 0 , 1 , 2 , 3 , 4 , (i e the next value will be 5 followed by , and so forth)

c 0 , 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 ,

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

QUESTION 1.8

Consider the following code fragment Note that `x, y` and `z` are `int` variables

```
if (x == 2)
     if (y >= 110)
          z = y / x,
     else
          z = y * x,
else
     z = y + x,
```

Which of the following pieces of code will give exactly the same result as the code above?

a
```
switch (x)
{
     case 2
               if (y >= 110)
               z = y / x,
               else
               z = y * x,
     default
               z = y + x,
}
```

b
```
switch (x)
{
     case 2
               z = y / x,
               break,
     case 110
```

```
                    z = y * x,
                    break,
            default
                    z = y + x,
        }
c       switch (x)
        {
            case 2
                    if (y >= 110)
                    z = y / x,
                    else
                    z = y * x,
                    break,
            default
                    z = y + x,
        }
c       switch (x)
        {
            case 2
                    z = y / x,
            case 110
                    z = y * x,
            default
                    z = y + x,
        }
```

QUESTION 1.9

The *GoodHope* high school will pay for a learner's rugby tour under the following conditions

- The learner s parents total income is less than R48,000 per year and the learner is not their only child

  OR

- The learner has an average of 80% or more and plays in the A team

A `float` variable `income` represents the income of the parents A `bool` variable `only` has the value `true` if the learner is an only child, and `false` otherwise A `float` variable `average` represents the learner's average and the `bool` variable `team` has the value `true` if the learner plays for the A team, and false otherwise The boolean variable `pay` should receive the value `true` if the above conditions are met Which of the following options will assign the correct value to `pay`?

```
1  pay = (income < 48000 00 && only) || (average >= 80 00 && team);
2  pay = (income < 48000 00 && !only) || (average >= 80 00 && team),
3  pay = (income < 48000 00 && !only) && (average >= 80 00 && team),
4  pay = (income < 48000 00 || !only) || (average >= 80 00 || team),
```

QUESTION 2 **4 MARKS**

In Questions 2(a) and (b) you have to write down what the purpose of the segment of code is. Look at the following example before answering the questions

```
int a,b,c,

cin >> a >> b >> c,
cout << c + b + a,
```

The purpose of the above code segment is to input three integer values and display their sum. Now answer questions 2(a) and (b) below

(a) Assume that s and n have been declared as integers. Explain in words what the purpose of the following segment of code is (2)

```
int s = 0,
int n = 0,


while (n <= 5)
{
      s = s + n,
      n++,
}
```

(b) Explain the purpose of the following segment of code (2)

```
int numbers[ ] = {11, 0, 15, 0, 16, 23},
int c = 0,
for (int i = 0, i <= 5, i++)
      if (numbers[i] != 0)
            c += 1,
```

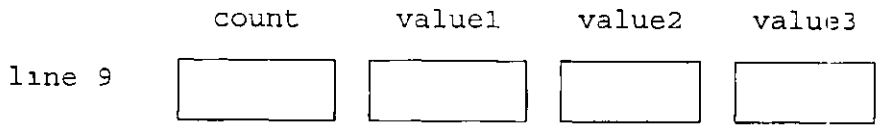
QUESTION 3 **6 MARKS**

Using the program below, please answer the variable diagram questions that follow (6)

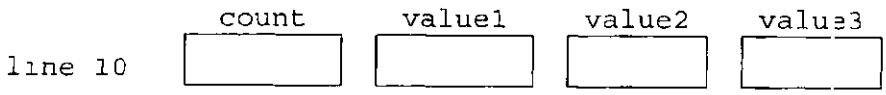
Assume that the following input is given `5 10 7`

```
1  #include <iostream>
2  using namespace std,
3  int main()
4  {
5      int count = 0, value1, value2, value3,
6      cin >> value1 >> value2 >> value3,
7      while (count <= 4)
8      {
9        value2 = value1++ * 2,
10       value1 -= 2 + value3,
11       value3 = value1-- + value2 * 2,
12       count += 2,
13     }
14     return 0,
15 }
```

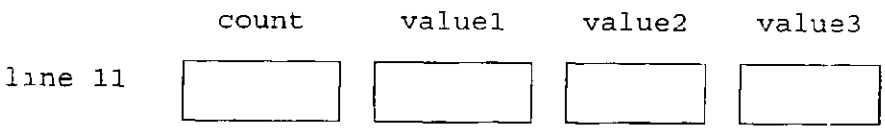
(i) Complete the variable diagram to reflect the situation after line 9 has been executed for the first time? (2)



(ii) Complete the variable diagram to reflect the situation after line10 has been executed for the first time? (2)



(iii) Complete the variable diagram to reflect the situation after line 11 has been executed for the first time? (2)



QUESTION 4 **5 MARKS**

At a tollgate the number of vehicles with two wheels, four wheels and more than four wheels respectively are counted Write down ONLY the necessary `switch` statement to count the number of vehicles with two wheels, four wheels and more than four wheels Do NOT write a complete program Use the following variables

```
int nrWheels,                    // number of wheels of a vehicle
                                 // passing the tollgate


int count2, count4, countMore, // the counters for the number of
                               // vehicles with two wheels,
                               // four wheels and more than four
                               // wheels respectively
```

Assume that `count2, count4` and `countMore` have been initialised already and that a value has been input and validated for `nrWheels`

QUESTION 5 **7 MARKS**

Two friends, Ella and Bella, share a stall and a cash register at a fair To keep track of each one's sales, they enter either an 'E' or a 'B' to indicate which one s product was sold as well as the amount of the sale The (incomplete) program below is used to determine Ella's and Bella's sales Complete the program by providing the `while` loop structure to input and total both Ella's and Bella's sales The loop should stop when any character other than an 'E' or a 'B' is entered

```
#include <iostream>
using namespace std,

int main()
{
     char name,      //character to indicate the name 'E' for Ella
                     //and 'B' for Bella
     float sale,                //value of one specific sale
     float eSales = 0,    //total of Ella's sales
     float bSales = 0,    //total of Bella's sales
     cout << "Whose product? Enter 'E' (Ella) or 'B' (Bella)  ",
     cin >> name,

     //your statements

     cout setf(ios  fixed),
     cout precision (2),
```

```
    cout << "Ella sold goods to the value of R"  << eSales << endl,
    cout << "Bella sold goods to the value of R" << bSales << endl,
    return 0,
}
```

QUESTION 6 **6 MARKS**

The interest rate used on funds deposited in a bank is determined by the amount of time the money is left on deposit For a particular bank, the following schedule is used

time on deposit	interest rate
greater than or equal to 5 years	0 0475
less than 5 years but greater than or equal to 4 years	0 045
less than 4 years but greater than or equal to 3 years	0 040
less than 3 years but greater than or equal to 2 years	0 035
less than 2 years but greater than or equal to 1 years	0 030
less than 1 year	0 025

Using this information, write a program that accepts the time that funds are left on deposit and displays the interest rate corresponding to the time entered Make use of a nested `if`-statement Write down ONLY the necessary statements - do NOT write a complete program Use the following variables

```
double time,        // time the funds are left on deposit
double interest,    // the interest rate that corresponds to the
                    // time entered
```

QUESTION 7 **6 MARKS**

In this question you have to write a complete function

The Blue Beach Shop keeps record of the sales for each day for a whole year (365 days) These 365 sales are stored in a `float` array called `sales` You have to write a function called `calcAverage` to determine the average sales per day for the year

Assume the following

- a declaration of a global constant
```
const int NUM_DAYS = 365, // number of days per year
```
- two declaration statements in the main function
```
float sales[NUM_DAYS],    // list of sales
float average,            // the average sales per day
```
- values have been assigned already to all the elements of the array
- the function is called in the main function as follows
```
average = calcAverage(sales),
```

Write down ONLY the complete function `calcAverage`

QUESTION 8 **5 MARKS**

Mary, Beauty and Mpho train for the Comrades marathon and for four weeks keep a record of the total distance each of them put in during that week. The (incomplete) program below inputs the respective distances and stores them in a two-dimensional array called `training` with four rows and three columns. The program then displays for each week, the longest distance anyone covered.

Here is an example of the input data for the program

	Mary	Beauty	Mpho
Week 1	100	120	103
Week 2	96	122	111
Week 3	110	101	119
Week 4	106	99	102

And the corresponding output

```
The longest distance covered in week 1 was 120 km
The longest distance covered in week 2 was 122 km
The longest distance covered in week 3 was 119 km
The longest distance covered in week 4 was 106 km
```

Use the declarations below and do the following questions

```
const int NUM_WEEKS = 4,
const int LADIES = 3,
```

(a) Declare the two- dimensional array `training` (2)

(b) Write statements to input the array (3)

QUESTION 9 **11 MARKS**

(a) Write a function header for each of the following (1 mark each)

(i) The function `check()` has two parameters The first parameter should be an integer number and the second parameter a floating point number The function returns no value

(ii) The function `mult()` has two floating point numbers as parameters and returns the result of multiplying them

(iii) The function `time()` inputs seconds, minutes and hours which are all integer values and returns them as parameters to its calling function

(b) Explain the difference between the functions `doubleNum1` and `doubleNum2` and for each function provide a statement that calls the function (4)

```
void doubleNum1 (int &value)
{
     value *= 2,
}

int doubleNum2 (int value)
{
     return (value *= 2),
}
```

(c) Write a function that returns the cube of the integer passed to it For example `cube(2)` will return 8 and `cube(3)` will return 27 Also complete the `main` function that calls the cube function Note that the `main` function inputs a value with which the cube function must be called (4)

```
// cube function that return the cube of the given integer
// YOUR cube FUNCTION CODE SHOULD COME HERE

// main program that tests the cube function
int main()
{
     int n,
     int answer,
     cin >> n,

     // CALL cube. WRITE ONLY ONE STATEMENT

     cout << answer,
     return 0,
}
```

QUESTION 10 **6 MARKS**

Consider the following struct definition

```
struct ShoeType
{
     char style,
     double price;
}
```

(a) Given this structure type definition, what output will be produced by the code below? (2)

```
ShoeType shoe1, shoe2,
shoe1 style = 'A',
shoe1 price = 9 99,
cout << shoe1 style << " R "  << shoe1 price << endl,
shoe2 = shoe1,
shoe2 price = shoe2 price/9,
cout << shoe2 style << " R "  << snoe2 price << endl,
```

(b) Write a function `read_Shoe_Record` which accepts a reference parameter `new_Shoe` of type `ShoeType` `read_Shoe_Record` fills `new_Shoe` with values entered from the keyboard (4)

QUESTION 11 **6 MARKS**

(a) Write a `void` function named `changeCase()` that changes all uppercase characters to lowercase characters and lowercase characters to uppercase characters in a string The function should take only one parameter, namely the string to be changed For example, if the string is called `message` and contains the string `Happy Holidays`, the function call `changeCase(message)` should replace the value of message with `hAPPY hOLIDAYS` The changes made to the string should be reflected in the calling program Write ONLY the function (5)

(b) Consider the following declaration

```
string string1 = "Hello",
string string2 = "Hello there",
```

What will the output be of the following code? (1)

```
if(string2 substr(0,5)== string1)
{
    string2 replace(5,10, string1),
}
else
{
```

```
string2 erase(5),
}
cout << "The modified string is " << string2,
```

You may find the following library functions useful for answering the above two questions

function signature	description
`bool isupper(char)`	Returns `true` if the `char` parameter is a uppercase letter, otherwise it returns `false`
`bool islower(char)`	Returns `true` if the `char` parameter is a lowercase letter, otherwise it returns `false`
`char toupper(char)`	Returns the uppercase equivalent if the `char` parameter is a lowercase character, otherwise it returns the character without modification
`char tolower(char)`	Returns the lowercase equivalent if the `char` parameter is a uppercase character, otherwise it returns the character without modification
`int size( )`	Returns the size (i e length) of a `string` object
`string substr(int, int)`	Returns a substring of a `string` object The first parameter specifies the starting position (i e the position from which the substring should be copied) and the second parameter specifies how long the substring should be (i e how many characters should be copied) The second parameter may be omitted, in which case the substring consisting of all the characters from the starting position (specified by the first and only parameter) to the end of the string are returned
`void erase(int, int)`	Erases a substring from a `string` object The substring that is to be erased is determined by the two parameters from the position specified by the first parameter, as many characters as specified by the second parameter