UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

COS1511

May/June 2020

Introduction to Programming I

Duration : 2 Hours

100 Marks

EXAMINERS :

FIRST : MS P MVELASE

SECOND : DR MA SCHOEMAN

Use of a non-programmable pocket calculator is permissible.

Closed book examination.

This paper consists of 12 pages.

INSTRUCTIONS:

1. Answer all the questions in the answer book.
3. Number your answers and label your rough work clearly.
4. Section A consists of MCQs
5. In Section B marks are awarded for part of an answer, so do whatever you are able to in each question.

ALL THE BEST!

SECTION A 20 MARKS

Choose one option for every question. If, for example you choose option 2 as the correct answer for Question 1, and option 4 as the correct answer for Question 2, please answer as follows:

1. 2
2. 4

etc.

QUESTION 1 2 marks

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

```
string name, course;
char sex;
int age;
float cost;
bool approved;
```

If the following function header is given:

```
bool approveApplication(int ageP, char sexP, string nameP,
                        string courseP, float costP)
```

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

1. `approveApplication (30, m, Peter Sibande, HIV, 5499.00);`
2. `approved = approveApplication (30, 'm', 'Peter Sibande', 'HIV', 5499.00);`
3. `approved = approveApplication(int age, char sex, string name, string course, float cost);`
4. `if (approveApplication (30, 'm', "Peter Sibande", "HIV", 5499.00)) cout << "Yes";`

QUESTION 2 2 marks

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

```
string name, qualification;
char sex;
int age, yearsExperience;
```

If the following function header is given:

```
void findCandidate(char sexP, int & ageP, string & nameP,
                   int yearsExperienceP, string qualificationP)
```

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

1. `findCandidate('m', 30, nameP, 7, "B.Curr");`
2. `findCandidate(sexP, ageP, nameP, yearsExperienceP, qualificationP);`
3. `findCandidate('m', 30, name, 7, qualification);`
4. `findCandidate('m', age, name,7, "B.Curr");`

QUESTION 3 2 marks

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

```
string name, course, date;
float cost;
bool approved;
```

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

```
approveFunds("Memory enhancement", "Ellen Subisa", date, 595.00,
             approved);
```

Which of the options below is a correct function header of the function `approveFunds`in the `main` function?

1. `void approveFunds(string courseP, string nameP, string & dateP, float costP, bool & approvedP)`
2. `void approveFunds(string & courseP, string & nameP, string dateP, float & costP, bool approvedP)`
3. `void approveFunds(course, name, date, cost, approved)`
4. `void approveFunds("Memory enhancement", "Ellen Subisa", date, cost, approved)`

QUESTION 4 2 marks

Which of the options below expresses the logic that neither of the following two statements are true?

- `i`is less than 4 or `i`is greater than 10,
- and `i`times `j`is greater than 54.

1. `(!((i < 4 || i > 10) && (i*j > 54)))`
2. `(!((i < 4 || i > 10) || (i*j > 54)))`
3. `((i < 4 || i > 10) || (i*j > 54))`
4. `(!((i < 4 && i > 10) && (i*j > 54)))`

QUESTION 5 2 marks

Which of the options below expresses the logic that a person is ready if they are either not wearing jeans or they are wearing a hat and bronx shoes?

1. `ready = clothing != “jeans” || hat == ‘y’ && shoes == “bronx”;`
2. `ready = clothing != “jeans” && hat == ‘y’ || shoes == “bronx”;`
3. `ready = clothing != “jeans” || hat == ‘y’ || shoes == “bronx”;`
4. `ready = clothing != “jeans” && (hat == ‘y’ && shoes == “bronx”);`

QUESTION 6 2 marks

Consider the following C++ code segment:

```
if (i == j)
      cout << "1";
else if ((i % j) < 3)
      cout << "2";
else if (i < (j-1))
      cout << "3";
else
       cout << "4";
cout << "5";
```

If the value of `i` is 5 and the value of `j` is 6, which of the options below gives the correct output?

1. 25
2. 35
3. 15
4. 45

QUESTION 7 2 marks

Consider the following C++ code segment:

```
for (int i = 0; i < n; ++i)
{
    for (int j = 0; j < m; ++j)
    {
       if (i != j)
          cout << "0";
       else
          cout << "1";
    }
}
```

Which of the options below gives the correct output if the value of n is 2 and the value of m is 3?

1. 100010
2. 011101
3. 100100
4. 010001

Questions 8 to 10 are based on the following C++ program. Note that the conventions as explained in the Study Guide are used in the variable diagrams.

```
#include <iostream>
#include <string>
using namespace std;

float getAmount(float & priceP, string itemP, int & howmanyP)
{
     float total = priceP;
     if (itemP != "book" && priceP > 200)
         itemP = "book";
     else if (itemP == "birthday card" && howmanyP >= 10)
              priceP = priceP + 10 / 5;
     total += priceP;
     if (priceP <= 12)
         itemP = "pencil";
     howmanyP = 50;
     return total;
  }

  int main( )
  {
    string item;
    float price = 10, fee;
    int howmany = 40;
    fee = 20;
    item = "birthday card";
    fee = getAmount(price, item, howmany);
    if (item == "book")
        fee += 100;
    else if (item == "pencil")
            fee -= 6;
         else fee += 15;
    cout << "Total cost for items bought is : R" << fee << endl;
    return 0;
  }
```

QUESTION 8 2 marks

Which of the options below correctly reflects the situation after Line 10 has been executed?

Option	Line
1	10

[price]|priceP	[item]|itemP	[howmany]|howmanyP
12	"birthday card"	40

[fee]	total
20	10

Option	Line
2	10

[price]|priceP	[item]	[howmany]|howmanyP
10	"birthday card"	40

[fee]	itemP	total
20	"book"	10

Option	Line
3	10

[price]|priceP	[item]	[howmany]|howmanyP
12	"birthday card"	40

[fee]	itemP	total
20	"birthday card"	10

Option	Line
4	10

[price]|priceP	[item]|itemP	[howmany]
10	"birthday card"	40

priceP	[fee]	howmanyP
12	20	40

total
10

QUESTION 9 2 marks

Which of the options below correctly reflects the situation after Line 14 has been executed?

Option	Line
1	14

[price]|priceP	[item]|itemP	[howmany]|howmanyP
12	"pencil"	50

[fee]	total
20	22

Option	Line
2	14

[price]|priceP	[item]	[howmany]|howmanyP
10	"birthday card"	50

[fee]	itemP	total
20	"book"	20

Option	Line
3	14

[price]	[item]|itemP	[howmany]
10	"birthday card"	50

priceP	[fee]	howmanyP
12	20	50

total
22

Option	Line
4	14

[price]|priceP	[item]	[howmany]|howmanyP
12	"birthday card"	50

[fee]	itemP	total
20	"pencil"	22

QUESTION 10 — 2 marks

Which of the options below correctly reflects the situation after Line 29 has been executed?

Option	Line
1	29

price	item	howmany
12	"book"	50

fee
120

Option	Line
2	29

price	item	howmany
12	"birthday card"	50

fee
37

Option	Line
3	29

price	item	howmany
12	"pencil"	50

fee
16

Option	Line

price	item	howmany

4	29	10	"pencil"	40

fee
16

SECTION B 80 MARKS

QUESTION 1 12 marks

Parents of the pupils of the Park Primary School must pay an amount for outfits for the annual play. All pupils take part in the play, except the Grade 0 pupils. The amount that the parents have to pay is calculated as follows:

- The cost of the outfits for Grade 1 and 2 pupils is R45
- The cost of the outfits for Grades 3 to 5 is R65
- Grade 6 and 7 pupils may play one or two roles. If they play a leadrole, they may only play one role.

The cost of the outfits is R70 if they play one role. If this role is a leadrole, the cost is R100. If they play two roles, the cost is R130

Use a **switch**statement and write down ONLY the necessary C++ statements to calculate and display the amount to be paid or display an appropriate error message if required.

Do NOT write a complete program. Use the following variables:

```
int grade;
int fee;
bool leadrole;  // true if a child plays a leadrole
bool roles2;    // true if a child plays 2 roles
```

Assume that values have been assigned to these variables already.

QUESTION 2 10 marks

A construction company pays its temporary workers R100 per day if they work on a Monday to Saturday and R200 if they work on a Sunday. They only work when the company contacts them, so they do not work the whole month. Complete the program below that asks the user to enter the days that the worker has worked. The character '1' is entered if the day is Monday to Saturday and '2' if it is a Sunday. A total is also updated to count the number of Sundays that was worked. The program must then calculate the total amount that the worker must be paid at the end of the month. When all days have been entered, the character 'x' is entered to terminate the loop. Use an appropriate loop structure.

Do not introduce any additional variables. Write down ONLY the missing statements.

```
#include <iostream>
using namespace std;
int main()
{
   const float SUNDAY = 200;          // salary per day for sundays const
   float OTHER = 100;                 // salary per day for other days
   char whichDay;                     // '2' for Sundays, '1' for other
   days float totalAmount;            // total salary
   int nrSundays;                     // number of Sundays worked

  cout << "Enter first day:'2' for Sunday, '1' for other days" << endl;

// YOUR STATEMENTS SHOULD COME IN HERE

  cout <<  "Total salary:" << totalAmount << endl;
  cout <<  "number of Sundays worked:" << nrSundays << endl;

  return 0;
}
```

QUESTION 3	13 marks

In this question you have to write a complete function.

MyMedia Publishers uses two parallel arrays to keep track of the number of subscriptions for each of their 50 publications. Array `publications` holds the names of the magazines and newspapers published and array `subscriptions` holds the number of subscriptions for each corresponding magazine or newspaper. You have to write a `void` function, called `findMostSubs` to determine which publication has the most subscribers. Function `findMostSubs` has to return the name of the publication as well as the number of subscribers to that publication.

Assume the following:

- a declaration of a global constant:

```
const int NUM_PUBS = 50;   //number of publications
```

- four declaration statements in the main function:

```
string publications[NUM_PUBS];   // titles of the publications
int subscriptions[NUM_PUBS];    // number of subscriptions for the
                                 // corresponding publications
int nrMostSubscriptions;   // number of subscriptions for
                           // publication with most subscriptions
string mostSubscriptions;  // title of publication with most
                           // subscriptions
```

- values have been assigned already to all the elements of the arrays

- the function is called in the main program as follows:

```
findMostSubs(publications, subscriptions,
                mostSubscriptions, nrMostSubscriptions);
```

Write down ONLY the complete function `findMostSubs`.

QUESTION 4	16 marks

4.1 Declare two integer constants `ROWSIZE` equal to 4 and `COLSIZE`equal to 4. (4)

4.2 Declare two `int`two-dimensional arrays, namely (4)

- `play1`with `ROWSIZE`number of rows and `COLSIZE`number of columns, and
- `play2`with `ROWSIZE`number of rows and `COLSIZE`number of columns,

4.3 Assume that values have been assigned to all the elements of `play1`and `play2`. Also assume that an `int` variable `tricky`has been declared and intialised to `0`. Use nested `for`loops and write down the necessary C++ statements to do the following:

- Each row of `play1`is compared element by element to the corresponding row of `play2.`
- If the elements are equal, add the value of one element to `tricky.`
- If the elements are not equal, add the sum of the two elements to the value of `tricky.`

For example, if `play1` and `play2` are initialised as follows:

```
1  5  3  7          4  6  3  7
6  8  5  8   and    5  0  7  8
3  3  3  5          8  7  6  5
7  8  1  5          7  3  4  5
```

respectively, then the value of `tricky` will be:

```
5+11+3+7+11+8+12+8+11+10+9+5+7+11+5+5=128
```

Display the value of `tricky`. Do NOT write a complete program or any functions. Write down ONLY the required statements. (8)

QUESTION 5	14 marks

A bathroom warehouse keeps the following information for the items in stock:

- `description`(a string, for example “bath”)
- `code`to distinguish between items with the same description and color but of a different design (a string to store 6 digits, for example “123456”)
- `color`(a string, for example “white”)
- `number`in stock (an integer, for example 49)
- `price`(a floating point number, e.g. 349.95)

5.1 Write down the declaration for a `struct`for storing the information associated with one kind of item in stock. Give the name `Item`to the `struct`. (6)

5.2 Assume that an array

```
Item stock[50]
```

has been declared and that information for 50 items in stock has been stored in the array. The program fragment below prints the codes for all the white baths and determines the total number of white baths in stock. Now write down ONLY the necessary C++ instructions for line numbers 2,
4, 6, 8, 9 and 11 to complete this program fragment. Write down only the line number and the instruction that should appear next to the line number. (8)

```
1. int total;

2. //initialise total

3. //search through array to find all white baths
4. for (                    ) // examine all items
5. {
6. //test if item is a white bath
7. {
8.      // print codes for white baths
9.      // determine the total number of white baths in stock
10. }
11. // display total number of white baths in stock
```

QUESTION 6	15 marks

In this question you have to write a C++ program to convert a date from one format to another. You have to write a complete program consisting of a `main()` function and a function called `convertDate()`.

The function receives a string of characters representing a date in American format, for example

```
December 29, 1953.
```

The function has to convert this date to the international format. For example: If the string

```
December 29, 1953
```

is received, the string that the function should return must be

```
29 December 1953
```

Use the following C++ skeleton:

```
include <iostream>
#include <string>
using namespace std;

string convertDate(……)
{
      // Add the code for the function here

}
```

```
int main()
{
      string americanDate;

      // Add the code for the main function here

      return 0;
 }
```

The **main()** function should prompt the user to enter the string, then read the string and call function `convertDate()` to convert it to the required form.

Hint 1: Below the question we list a number of **string** member functions you may need.
Hint 2: Start the `convertDate()` function by determining the position of the first space character in the input.

A number of **string** member functions to help you

```
StringObject.size( )

StringObject.substr(startPos, length)

StringObject.find(substring)
StringObject.find(substring, startPos)

StringObject.insert(insertPos, substring);

StringObject.erase(startPos, length);

StringObject.replace(startPos, length, substring);
```

where

`startPos`, `length` and `insertPos` are of type `int`, and
`substring` is of type `string`.