CSCP1DB

October/November 2016

C++ AS SECOND PROGRAMMING LANGUAGE

Duration   2 Hours   75   Marks

EXAMINERS
FIRST   MRS P LE ROUX
SECOND   MR CL PILKINGTON

Closed book examination

This examination question paper remains the property of the University of South Africa and may not be removed from the examination venue

This paper consists of 7 pages and 6 questions
Please ensure that you have all 7 pages with the 6 questions

INSTRUCTIONS:

- Answer all the questions
- Do all rough work in the answer book
- The mark for each question is given in brackets next to the question
- Please answer the questions in the correct order If you want to do a question later, leave enough space
- Number your answers and label your rough work clearly
- Marks are awarded for part of an answer, so do whatever you are able to in each question

GOOD LUCK!

QUESTION 1 [19 MARKS]

1 1 Assuming x = 15 and y = 10, what are the values of the following conditions? (2)

a   x >= y - x

b   x == (y + x - y)

1 2 Evaluate each expression below if a = 10, b = 12, c = 8, and flag is false (2)

a   (c == (a * b)) || ' flag

b   '(b <= 12) && (a % 2) <= 20)

1 3 What value is assigned to x if y = 10 0? (1)

```
x = 20 0,
if (y '= (x - 10 0))
      x = x - 10 0,
else
      x = x / 2 0,
```

1 4 Write C++ statements to carry out the following If x is zero, add 1 to zeroCount If x is negative, add x to minusSum If x is greater than zero, add x to plusSum (3)

1 5 Explain the difference between the statement on the left (a) and the statement on the right (b) For each of them, what is the final value of x if the initial value of x = 1? (4)

```
a      if (x >= 0)            b      if (x >= 0)
            x = x + 1,                    x = x + 1,
      else if (x >= 1)             if (x >= 1)
            x = x + 2,                    x = x + 2,
```

1 6 For the program segment below

```
for (int i = 0, i < 9, i++)
{
      for (int j = 0, j < i, j++)
            cout <<   setw(4) << (i * j),
      cout << endl,
}
```

a How many times does the first cout statement execute? (1)

b How many times does the second cout statement execute? (1)

1 7 If the value of m is 5 and of n is 3, what is the value of the following expression? (1)

            m++ * --n,

1 8   Consider the following program segment

```
count = 0,
n = 5,
for (int i = 1, i <= n, i++)
{
    cin >> x,
    if (x % i == 0)
        count++,
}
```

a   Write a while loop equivalent to the for loop   (2)

b   Write a do-while loop equivalent to the for loop   (2)

QUESTION 2   [6 MARKS]

2 1   What is displayed by the program below?   (2)

```
void silly (int x)
{
    int y - x,
    x *= 2,
    cout << x << " , " << y << endl,
}

int main()
{
    int x, y,
    x = 8,
    y = 5,
    silly(x),
    cout << x << " , " << y << endl,
    silly(y),
    cout << x << " , " << y << endl,
}
```

2 2   Redo question 2 1 if silly's parameter is a reference parameter   (4)

QUESTION 3   [4 MARKS]

3 1   Consider the C++ code fragment that follows and answer the following questions

a   Explain what is wrong with the code in *line 2*   (1)

b   If corrected, what is the output produced by statement 8?   (1)

```
1   char name[],
2   name[] = "James Khumalo",
3   for(int i = 0, name[i] != '\0', i++){
4   if(name[i] -- 'm'){
5   name[i] = '*',
6   }
7   }
8   cout<<name,
9   cout<<endl,
```

3 2   What output would be produced by the following C++ code fragment   (2)

```
vector <int > myList (10),
int i = 0,
for(int i = 1, i < myList size(), i++)
      myList[i] = i,

vector <int> copy,
copy = myList,
myList[0] = 42,

for(i = 0, i < copy size(), i++)
      cout << copy[i] << " ",
cout<< endl,
```

QUESTION 4 [8 marks]

4 1   Write a single statement that performs the indicated task Declare variable ptr1 to be a pointer to an integer and create a new dynamic array with ten integer elements to which ptr1 points   (3)

4 2   Consider the program segment that follows

```
struct electric
{
     string current,
     int volts,
},
electric *p, *q,
```

Give a statement to accomplish each task   (5)

a   Give a C++ statement to assign the value "ca" to the current member of the struct pointed to by p
b   Give a C++ statement to assign the value of the volts member of the struct pointed to by q to the value of the volts member of the struct pointed to by p
c   What will the effect of the statement *p = *q, be?
d   What will the effect of the statement p = 54, be?
e   What will the effect of the statement p = q, be?

QUESTION 5 [26 marks]

Given a class TimeOfDay that represents the time of day in terms of hours, minutes and seconds This class has three integer member variables
- seconds
- minutes
- hours

In addition, the class has the following member functions
- A **default constructor** that initializes the members to 0
- An **overloaded constructor** that accepts integer values for each of the data members
- A member function Increment() which returns a TimeOfDay object that is incremented by one second
- A member function which returns true if this TimeOfDay object is earlier than another instance of the TimeOfDay object passed as a parameter Name the function LessThan
- An **overloaded stream insertion operator** << (implemented as a **friend** function) to output the hours, minutes and seconds Use the following prototype
  ```
  ostream& operator << (ostream& outs, const TimeOfDay& the_time),
  ```
- An **overloaded stream extraction operator** >> (implemented as a **friend** function) to input the hours, minutes and seconds Use the following prototype
  ```
  istream& operator >> (istream& ins, TimeOfDay& the_time),
  ```

5 1 Implement the six member functions defined in the class TimeOfDay (15)

5 2 Complete the application program (main()) that follows by citing the number and writing down the missing statements This program creates five instances of the class TimeOfDay It then reads in a TimeOfDay object named currentTime to checks each one against and if the currentTime is less the time of the objects, it is written to a file (11)

For example, if currentTime is 12 45 50 and the five TimeOfDay instances created is

```
22 50 50
09 35 00
17 53 04
03 19 00
14 12 20
```

The program should produce the following output file named outFile.txt

```
09 35 00
03 19 00
```

[TURN OVER]

```
#include <iostream>
#include <fstream>
#include "TimeOfDay h"
using namespace std,

int main()
{
```

| // ❶ | Declare and open the output file and test if successfully opened |

```
TimeOfDay currentTime(12,45,30),
```

| // ❷ | Declare an array called aTime, consisting of 5 values of type TimeOfDay |

| // ❸ | Using a for loop, enter the values for the data member of the class TimeOfDay using the overloaded insertion operator |

| // ❹ | Compare currentTime with each element of the array of TimeOfDay objects to determine if it is earlier as CurrentTime or not and write appropriate message to the output file |

```
    outFile close(),
    return 0,
}
```

QUESTION 6   [12]

Consider the following class

```
class Module
{
public
    Module(),
    Module(string dept, string mCode, double tFee),
    void displayFee(ostream &out)const,
    string get_department()const,
    string get_moduleCode()const,
    double get_tuitionFee()const,
    void set_department(string d),
    void set_moduleCode(string m),
    void set_tuitionFee(double t),
private
    string department,
    string moduleCode,
    double tuitionFee,
},
```

6 1   Derive a class LabModule from class Module Only provide the specification of the class, NOT
       the implementation This class has an additional member variable, double labFee Class
       LabModule also has member functions, get_labFee() and set_labFee() to return member
       variable labFee and to update member variable labFee respectively The class LabModule
       should override function displayFee() in order to display the fee for the module, which will
       be the sum of the labFee and the tuitionFee The class has default and parametrized
       constructors Provide only the interface of class LabModule in terms of a header file The
       header file should contain compiler directives to prevent multiple definitions Assume that the
       interface of class Module is contained in an interface file called Module h   (5)

6 2   Implement the overloaded constructor for the class LabModule by invoking the base class
       constructor   (3)

6 3   Implement the member function displayFee for the class LabModule   (3)

6 4   Is function displayFee for the class LabModule an example of overloading? Explain your
       answer   (1)