UNISA
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COS111U

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INTRODUCTION TO PROGRAMMING 1 (COMPUTER SCIENCE 111)

Duration : 2 Hours

100 Marks

EXAMINERS :		
FIRST :	MS HW DU PLESSIS	MS MA SCHOEMAN
	MS K PADAYACHEE	
SECOND :	MR KJ HALLAND	

This paper consists of 12 pages.

INSTRUCTIONS:

1. Answer all the questions in the answer book.
2. Do all rough work in the answer book as well.
3. Number your answers and label your rough work clearly.
4. In Questions 2 to 7 marks are awarded for part of an answer, so do whatever you are able to in each question.
5. You may answer in English or Afrikaans.

ALL THE BEST!

QUESTION 1   20 MARKS   (10 MULTIPLE CHOICE QUESTIONS, 2 marks each)

Please answer this question **in the answer book**. *Choose one option for every question.* Mark your answers clearly. If, for example you choose option 2 as the correct answer for Question 1(a), and option 4 as the correct answer for Question 1(b), please answer in the book as follows:

Question 1
   (a) 2
   (b) 4
     etc.

QUESTION 1(a)

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";
5.      None of the above is a correct calling sequence
```

QUESTION 1(b)

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)
```

[TURN OVER]

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");`
5.   None of the above is a correct calling sequence

QUESTION 1(c)

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);`
5.   All of the above options are correct function headers.

QUESTION 1(d)

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))`
5. `(!((i < 4 && i > 10) && (i*j > 54)))`

QUESTION 1(e)

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");
5. None of the options above is a correct assignment statement.
```

QUESTION 1(f)

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
5. 4
```

QUESTION 1(g)

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. 011101
2. 100100
3. 010001
4. 000100
5. 100010

Questions 1(h), (i) and (j) are based on the following C++ program. Note that the conventions as explained in the Study Guide are used in the variable diagrams.

```cpp
1      #include <iostream>
2      #include <string>
3      using namespace std;

4      float getAmount(float & priceP, string itemP, int & howmanyP)
5      {
6          float total = priceP;
7          if (itemP != "book" && priceP > 200)
8              itemP = "book";
9          else if (itemP == "birthday card" && howmanyP >= 10)
10                 priceP = priceP + 10 / 5;
11         total += priceP;
12         if (priceP <=12)
13             itemP = "pencil";
14         howmanyP = 50;
15         return total;
16     }

17     int main( )
18     {
19         string item;
20         float price = 10, fee;
21             int howmany = 40;
22             fee = 20;
23         item = "birthday card";
24         fee = getAmount(price, item, howmany);
25         if (item == "book")
26             fee += 100;
27           else if (item == "pencil")
28                 fee -= 6;
29               else fee +=15;
30         cout << "Total cost for items bought is : R" << fee << endl;
31         return 0;
32     }
```

QUESTION 1(h)

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	"bithday card"	10

Option	Line
4	10

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

priceP	[fee]	howmanyP
12	20	40

total
10

Option	Line
5	10

None of the above options is correct

QUESTION 1(i)

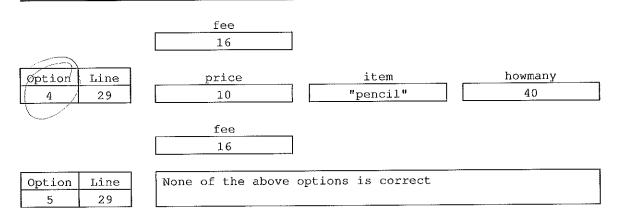Which of the options below correctly reflects the situation after Line 14 has been executed?

Option	Line
1	14

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

[fee]	total
20	22

Option	Line	[price]|priceP	[item]	howmany|howmanyP
2	14	10	"birthday card"	50

[fee]	itemP	total
20	"book"	20

Option	Line	[price]	[item]|itemP	[howmany]
3	14	10	"birthday card"	50

priceP	[fee]	howmanyP
12	20	50

total
22

Option	Line	[price]|priceP	[item]	howmany|howmanyP
4	14	12	"birthday card"	50

[fee]	itemP	total
20	"pencil"	22

Option	Line	
5	14	None of the above options is correct

QUESTION 1(j)

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

Option	Line	price	item	howmany
1	29	10	"book"	50

fee
120

Option	Line	price	item	howmany
2	29	12	"birthday card"	50

fee
37

Option	Line	price	item	howmany
3	29	12	"pencil"	50

[TURN OVER]

fee

| 16 |

Option	Line
4	29

price

| 10 |

item

| "pencil" |

howmany

| 40 |

fee

| 16 |

Option	Line
5	29

| None of the above options is correct |

QUESTION 2   [12]

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 <u>calculate</u> and <u>display</u> 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 3   [10]

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 4   [13]

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 5 [16]

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

(b) 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,

(c) 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 6 [14]

A sanitary ware shop 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 colour but of a different design (a string to store 6 digits, for example "123456")
- colour (a string, for example "white")
- number in stock (an integer, for example 49)
- price (a floating point number, e.g. 349.95)

(a) 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)

(b) 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.       //update the total number of white baths in stock
10. }
11. //display total number of white baths in stock
```

QUESTION 7   [15]

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
        29 December 1953
should be returned to the main function.

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`.

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