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Introduction to Programming I

Duration : 2 Hours

80 Marks

EXAMINERS :

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SECOND : MRS A MATHEW

Closed book examination.

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This paper consists of 9 pages.
Out of 80 marks.

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. Marks are awarded for part of an answer, so do whatever you are able to in each question.

ALL THE BEST!

QUESTION 1	5 marks

Complete the statements by providing only the missing words:

1.1 The …….. control structure in C++ makes use of a selector expression which must be of an ordinal data type. (1)

1.2 The …….. is an arithmetic operator in C++ whose operands are always integer values. (1)

1.3 The type of error that invariably causes a C++ program to crash during execution is called the …… error. (1)

1.4 The values provided in a function call are called the …… parameters. (1)

1.5 `insert()` is a member function of the …….. class. (1)

QUESTION 2	5 marks

State whether the following statements are true or false:

2.1 The statement `int twoDim[][];` correctly declares a two dimensional integer array. (1)

2.2 The statement `int numbers[ ] = {10};` declares a ten element array of integer values. (1)

2.3 The variable declaration in C++ is optional. (1)

2.4 The assignment operator in C++ is a binary operator. (1)

2.5 The `struct` data structure can have members of different data types. (1)

QUESTION 3	6 marks

3.1 Declare an integer constant `NUM` with value 100. (1)

3.2 Concatenate two `string` variables `name` and `surname` to create one string in a `string` variable `fullName`. Assume variable declarations. (1)

3.3 Consider the string initialisation:

```
string ticket = "Economy Class";
```

Write the C++ statement that will replace the substring “Economy” in the string “Economy Class” with “Business”, so that the value of the variable `ticket` becomes “Business Class” . (2)

3.4 Suppose we want to assign the value `true` to a `bool` variable `pass` if:

- the value of the `int` variable `exam` is greater than or equal to 50 and the value of the `char` variable `assignmentSubmitted` is `'y'`.

Write the correct assignment statement? (2)

QUESTION 4 17 marks

4.1 Complete the following program by giving the full definition for the function `calcSum` as your answer. The function adds the two integer values it receives. (4)

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

//the definition for function calcSum
…….


void printSum(int s)
{
     cout << s;

}

int main()
{
     int a = 10, b = 5;
     printSum(calcSum(a,b));
     return 0;
}
```

4.2 Suppose the five C++ instructions below occur in a program. What will be the output displayed on the screen? (2)

```
int x;
int y = 113;
y--;
x = y++;
cout << x << " " << y << endl;
```

4.3 Convert the following `for` loop to a `while` loop (3)

```
for (int i = 12; i >= 5; i-=1)
     cout << "#" << endl;
```

4.4 What is the output of the following code fragment? (2)

```
int counter1 = 0;
int counter2 = 0;
for (int i = 0; i < 2; ++i)
{
     ++counter1;
     for (int j = 0; j <= 4; ++j)
     {
          if (i == j)
               ++counter2;
     }
}
cout << counter1 << " " << counter2;
```

4.5 Consider the following code for a textbook store: (6)

```
float price = 500; //standard price
char productStatus;

cin >>  productStatus;

if(productStatus == 'f') //the book is sold at full price
     price = price;
else if(productStatus == 'd') //the book is sold at a discount
     price = price - (price *0.10);
else if(productStatus == 'o') //the book is out of stock
     cout << "Out of stock" << endl;
else
     cout << "Invalid product status!" << endl;
```

Convert the nested `if` statement into a `switch` statement.

QUESTION 5	6 marks

Write a **function header** for each of the following (Write **ONLY** the function header):

5.1 The function `circle()` that receives the radius of a circle as a floating point value parameter, and calculates the area and circumference of the circle, storing the results in two reference parameters. (2)

5.2 The function `countSpaces()` that returns the number of spaces in a string received as a parameter. (2)

5.3 The function `searchArray()` that receives an array of integers `intArray` and an integer `check` as its parameters. The function returns a `true` value if the integer `check` is in the array `intArray`. (2)

QUESTION 6	8 marks

Draw variable diagrams for the program given below using the input **20 10 5** (8)

```
1   #include <iostream>
2   using namespace std;
3   int main()
4   {
5    int a, b, c, temp;
6    cout<< "Enter values for a, b and c, separated by spaces: ";
7    cin >> a >> b >> c;
8    if (b > c)
9    {
10        temp = b;
11        b = c;
12        c = temp;
13   }
14   else if (a > c)
15   {
16        temp = a;
17        a = c;
18        c = temp;
19   }
20   if (a > b)
21   {
22        temp =a;
23        a = b;
24        b = temp;
```

```
    }
25  cout << a << ' ' << b << ' ' << c << endl;
26  return 0;
27 }
```

QUESTION 7	12 marks

The below table contains the stock of three types of furniture items in three different upholstery covering material. The numbers in stock have to be stored in a two-dimensional integer array.

	Suede	Leather	Cotton
Couch	50	10	20
Chair	40	50	60
Ottoman	30	20	10

7.1 Write the program statements to declare an integer constant `STOCK_ITEMS` for the number of different furniture items in stock, and an integer constant `NR_MATERIALS` for the number of upholstery types. (2)

7.2 Write down the necessary C++ statement to declare and initialise the `stockArray` with the values in the table. Use the constants declared in 7.1 (2)

7.3 For stock taking purposes, the owner wants to know how many units of furniture are in the shop.

(a) Write down the necessary C++ statements to calculate and display the total number of furniture items in the shop. Do NOT write a complete program. Write down ONLY the required statements. Assume the following declaration:

```
int totalItems = 0;
```

(4)

(b) Write down the necessary C++ statements to calculate and display the total number of leather furniture items in the shop. Do NOT write a complete program. Write down ONLY the required statements. Assume the following declaration: (4)

```
int leatherItems = 0;
```

QUESTION 8	15 marks

The Great Golf Club registers the following information for each player on a specific day:

- name (a string, for example "Gary Player")
- handicap (an integer, for example 10)
- shots (an integer, for example 49)

8.1 Write down the declaration for a `struct` for storing the information associated with one player. Give the name `Player` to the `struct`. (4)

8.2 Declare an array named `players` with 50 elements of type `Player`. (2)

8.3 Assume that the information for 50 golf players have been stored in the array declared in 8.2. The program fragment below determines which player had the lowest score for the day. The score for each player is determined by deducting the player's handicap from the number of shots the player has taken. Then the name and the score for the player with the lowest score is printed.

Now write down ONLY the necessary C++ instructions for line numbers 4, 5, 7, 9, 10 and 12 to complete this program fragment. Write down only the line number and the instruction that should appear next to the line number. (9)

```
1. int lowestScore;
2. int winningPlayer; //used within the loop to store the index of
                      //the player with the lowest score
3. int score; //used within the loop to store the calculated score
              //for a player


4. //set lowestScore to the score of the first player in the array

5. //set winningPlayer to the index of the first player

6. //search through array(declared in 8.2) to find the player with
   //the lowest score
7. for ( ) //examine all players
8. {
9. //determine score for player being inspected
10. //determine lowest score and which player had lowest score
11. }
12. //print the name and score of the player with the lowest
    //score
```

QUESTION 9	6 marks

In this question the `main()` is given. You have to write a function `removeChar` that is called from the `main()`.

The function `removeChar` receives a string as parameter. The function has to do the following:

- find all occurrences of "i" in the string and erase them
- return the changed string to the `main()`

Example, if the string

```
Incy wincy spider
```

is given, the string

```
Incy wncy spder
```

should be returned to the `main()`. Write ONLY the function `removeChar`. (6)

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

//insert function removeChar here


int main()
{
    string sentence;
    //prompt user to enter a sentence
    cout << "Enter a sentence:" << endl;
    getline(cin, sentence, '\n');
     //output
    cout << "New sentence:" << endl;
    cout << removeChar(sentence) << endl;
    return 0;
}
```

You may find the following table of string functions useful.

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`.