Instructions to the student

Perusal time: 15 minutes
Examination duration: 180 minutes (3 hours)
Total mark: 50

There are three (3) sections in the examination.

Section 1: Contains 5 questions worth 3 marks each. You may attempt as many questions as you wish.

Section 2: Contains 4 questions worth 4 marks each. You may attempt as many questions as you wish.

Section 3: Contains 3 questions, the first two are worth 5 marks each, and the third is worth 9 marks. You may attempt as many questions as you wish.
### Section 1 – Question 1

State whether each of the following is true or false.

a. C++ program must contain a main() function  
   **Answer:** true

b. In C++, a single line comment can start with */ and end with /*  
   **Answer:** false

c. In C++, a global variable must be declared before it can be used
   **Answer:** true

d. In C++, the variable declarations int value; and int Value; are same
   **Answer:** false

e. Pseudo-code is not a programming language
   **Answer:** true

f. In C++, 5 % 2 is equal to 2.5
   **Answer:** false

0.5 mark for each correct true/false

### Section 1 – Question 2

Write the C++ source code (program) for the following pseudo-code.

set aCharacter to “A”  
set bCharacter to “B”  
set maxRows to 5  
set maxCols to 8  
set rowNum to 0  
while rowNum<maxRows  
  set rowNum to rowNum+1  
  set colNum to 0  
  while colNum<maxCols  
    set colNum to colNum+1  
    if (rowNum=0) then  
      write aCharacter  
    else  
      write bCharacter  
    write Newline

**Answer:**

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

const char aCharacter = 'A';  
const char bCharacter = 'B';  
const int maxRows = 5;  
const int maxCols = 8;  

void main()  
{  
    int rowNum, colNum;  
    rowNum=0;  
    while (rowNum < maxRows)  
    {  
```
Section 1 – Question 3

(3 marks)

Assume that the following program compiles and runs. What would be the output of this program?

```c++
#include <iostream.h>
void main()
{
    int number1=9, number2=4, number3=5, divRes=0, modRes=0, decRes=0;
    float sumRes=0, avgRes=0;

    sumRes = (float) (number1 + number2 + number3);
    divRes = number3/number2;    //integer division
    avgRes = sumRes/3;
    decRes = number1--;            

    cout << number1<< divRes << decRes << endl;
}
```

Answer:
8 1 9

1 mark for each correct value (number1, divRes and decRes)

Section 1 – Question 4

(3 marks)

Inspect the following program code and correct at least 3 syntax errors by stating the line number and then rewriting the line with the error corrected. You do NOT have to rewrite the whole program.
1 #include <iostream.h>
2 #include <iomanip.h>
3
4 //main function
5 void main (void)
6 {
7    int num1=5, num2=3;
8    if (num1==1) then
9    {
10      while (num2 >= num1)
11        {
12          if (num1 != num2)
13            {
14            cout "Condition is true\n";
15            num1++;
16          }
17          else
18            {
19            cin num1;
20            num2++;
21          }
22        }
23    }
24 }

Answer: 4 errors (students have to correct only 3)
8 if (num1==1)
14            cout <<"Condition is true\n";
17 else
19            cin>> num1;

1 mark for each corrected error.

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Section 1 – Question 5

(3 marks)

Identify the syntax error(s), if any, in each of the following declarations. Rewrite the
declaration with the error corrected. If there is no error, please write “no error”.

a. float numbers[]={1.0};

b. boolean ok=True;

c. int numbers[5]={1,2,3,4,5};

d. float floatNumbers={1.0, 2.3, 99.8};

e. char myName[]="TOM";

f. char myName[4]={“B”, “R”, “J”, “\0”};
Answer:

a. no error
b. bool ok=true;
c. no error
d. float floatNumbers[3]={1.0, 2.3, 99.8};
e. no error
f. char myName[4]={'B', 'R', 'J', '\0'};

0.5 marks for each correct answer

Section 2 – 4 Questions (16 Marks)

Section 2 – Question 1 (4 marks)

Assume that the following program compiles and runs. State what would be the output of the following program.

```c
#include <iostream.h>

void main()
{
    int count;
    for (count=0; count<3; count++)
    {
        int count1=0;
        while (count1<1)
        {
            cout<<"for and while loops\n";
            count1++;
        }
    }
    count=0;
    do
    {
        count++; cout<<"It is a do-while loop\n";
    } while (count<3);
    count=0;
    while (count<3)
    {
        count++; cout<<"It is a while loop\n";
    }
    for (count=0; count<3; count++)
    {
        cout<<"It is a for loop\n";
    }
}//end of program
```

Answer:
for and while loops
for and while loops
for and while loops
It is a do-while loop
It is a do-while loop
It is a do-while loop
It is a while loop
It is a while loop
It is a while loop
It is a for loop
It is a for loop
It is a for loop
1 mark for correct execution of for and while, do-while, while and for loops.

Section 2 – Question 2
(4 marks)
Assume that the following program compiles and runs. Give four reasons why this program was not written following good programming practise. Please do not write more than 1 line for each reason.

```c
#include <iostream.h>
int i=0;
int j=0;
int k=0;
int l=0;
void main(void)
{
  for(i=0; i<5;i++)
  {cin>>j; cin>>k; l=l+50+60+100+j+k;}
  cout<<l<<endl;
}
```

Answer (5 reasons below but students need to list only 4 reasons):
no indentation
no comments
use of global vars
use of meaningless var names
use of magic numbers
1 mark for each correct reason

Section 2 – Question 3
(4 marks)
When the following program is complied a syntax error occurs indicating that some elements of program are missing. Correct the errors and state what would be the output of the program.

```c
#include<iostream.h>
#include<stdlib.h>
void main()
{
  int i=0, numArray1[MAX], numArray2[MAX];
  //Store 10 values in numArray
  while (i<MAX)
  {
    numArray1[i]=i; numArray2[i]=i; i++;
  }
```
//Add numArray1 and numArray2
addArrays(numArray1, numArray2);
}

void addArrays(int numArr1[], int numArr2[])
{
    for (int count=0; count<MAX; count++)
    {
        numArr1[count] = numArr1[count] + numArr2[count];
        cout << numArr1[count] << " ";
    }
    cout << endl;
}

Answer:
Missing
void addArrays(int numArr1[], int numArr2[]);
const int MAX=10;
Output of the program:
0 2 4 6 8 10 12 14 16 18
2 marks for missing elements
2 marks for the output

Section 2 – Question 4

(4 marks)

Write a program that calculates RES using the following formula:

RES = (x + y + z)\textsuperscript{12} + e^{-5x} + \sqrt{7 \cdot y^{10}};

Where x=3.0, y=5.0
and z must be a random number between 0 and 7 (including 0 and 7).

The value of RES must be displayed on the screen.

Answer:
#include <iostream.h>
#include <stdlib.h>
#include <math.h>

void main()
{
    double x=3.0, y=5.0, z, RES;
    z=rand()%8;
    RES=pow((x+y+z), 12) + exp(-5*x) + sqrt(7*(pow(y,10))) ;
    cout << RES;
}
Section 3 – 3 Questions (19 Marks)

Section 3 – Question 1 (5 marks)

Assume that the following program compiles and runs. Examine it closely and answer the questions that follow.

```cpp
#include <iostream.h>
#include <stdlib.h>
const int ArraySize=11;
void main()
{
    int j=0, searchKey=5, index=0, count=0;
    int numArray[ArraySize]={5, 6, 7, 1, 5, 2, 10, 5, 16, 8, 5};
    while (j<ArraySize)
    {
        if (numArray[j] == searchKey)
        {
            count++;  index = j;
            cout << numArray[index] << endl;
        }
        j++;
    }
    cout << count << endl;
    cout << index << endl;
}
```

a. What does this program do (for example: sorting, searching, etc.)? Write your answer in one line.

Answer: searching (1 mark for correct answer)

b. What would be the output of this program?

Answer:

a. 5
b. 5

2 marks for above correct values (0.5 mark/output)
Section 3 – Question 2

(5 marks)

Write a program that reads Radius (R), calculates and displays Area (A), Diameter (D) and Circumference (C) of the circle as follows:

\[
A = 3.14 \times R \times R \\
D = 2 \times R \\
C = 3.14 \times D
\]

The program must use a main function and 4 other functions as described below.

// Function prototypes should be here.

void main()
{
   // Variables should be declared here.
   // All 4 functions should be called here.
   // The calculated values Diameter, Area and Circumference should be printed here.
}

float readRadius()
– this reads Radius

float calcDiameter(float radius)
– this calculates Diameter

float calcArea (float radius)
– this calculates Area

float calcCircumference (float Diameter)
– this calculates Circumference

Answer:
#include<iostream>
using namespace std;

OR
#include <iostream.h>

float readRadius(float rad )
{
   cout << "Please enter Radius value: ";
   cin >> rad;
   return rad;
}

float calcArea(float R)

return 3.14 * R * R;
}

float calcDiameter(float R)
{
    return 2 * R;
}

float calCircumference(float D)
{
    return 3.14 * D;
}

4 Mark: 1 each for each function (0.25 function prototype)
1 Mark: for main function

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**Section 3 – Question 3**

(9 marks)

The program below opens the file (in.txt), reads final marks from in.txt into an array called finalMarks and calculates the average mark. Inspect the following program code and correct 9 mistakes (line numbers 2, 4, 11, 14, 20, 21, 24, 27, 29) by rewriting the line with the error corrected. You do NOT have to rewrite the whole program.

1. `#include <iostream>`
2. `#include <fstream>`      //correct ERROR
3. `using namespace std;`
4. `const char MaxStud=20`    //correct ERROR
5. `void main(void)`
6. `{
7.    float finalMarks[MaxStud], sum=0, avg=0;
8.    int totStud=0;
9.    ifstream in;
10.   //Open file in.txt for reading
11.   in.openfile[in.txt];`     //correct ERROR
12. `   if (!in)
13.     { `write "file in.txt could not be opened"; “//correct ERROR
14.         exit(1);
15.     }
16.   }`     //correct ERROR
17. `   else
18.     { `Read the final marks & calculate total number of students
19.         in.read >> finalMarks[totStud];`     //correct ERROR
20. `         while (!in.eof(infile))`     //correct ERROR
21. `         { `totStud++;`     //correct ERROR
22. `             in >> finalMarks[index];`     //correct ERROR
23. `         }
24. `   //Close file after reading
25.     in.close("openfiles");`     //correct ERROR
26. `     for(int count=0; count<totStud; count++)`
27. `         sum += finalMarks[count];`     //correct ERROR
28. `     avg = sum / totStud;
29.   }
30.   //Close file after reading
31.   in.close("openfiles");`     //correct ERROR
32. `   //Print average mark
33.   cout << "Average mark: “ << avg;`     //correct ERROR
34. `   } //main
35. `}` //void main
29. `sum = sum [count] + finalMarks;` //correct ERROR
30. `cout << "Sum: " << sum << endl;`
31. `avg=sum/count;`
32. `cout << "Average Mark: " << avg << endl;`
33. `}`
34. `}`

Answer:
9 corrected errors
#include<fstream.h>
const int MaxStud=20;
in.open("in.txt");
cout<<"file in.txt could not be opened";
in>> finalMarks[totStud];
while (!in.eof())
in >> finalMarks[toStud];
in.close();
sum = sum + finalMarks[count];

1 mark for each corrected error

******************************************************************************END OF EXAM******************************************************************************