SECTION A – TRUE/FALSE QUESTIONS **[15 marks]**

There are **TEN (10)** questions in this section. For each question, identify whether the statement in the question is TRUE/FALSE and support your answer with its REASON. Write your answers in the answer booklet provided. Each question carries 1.5 marks.

1. The program in Figure A-1 calculates the average of three numbers, when data input are 2,3,4,-1.

```
 1 #include <iostream>
 2 using namespace std;
 3
 4 int main()
 5 {
 6     int num, n = 0;
 7     double avg=0.0, sum = 0.0;
 8
 9     cin >> num;
10
11     while( num != -1 )
12     {
13          n++;
14          sum = sum + num;
15          cin >> num;
16     }
17     avg = sum/n;
18
19     cout<<"The average of " <<n<<" numbers is "<< avg <<endl;
20
21     return 0;
22 }
```

Figure A-1

2. When a variable is defined in the initialization expression of a `for` loop, its scope is not limited to the loop.

3. The `continue` statement causes a terminated loop to resume its execution.

4. The body of a `do/while` loop will never be executed if the test condition for the first time is `false`.

5. A value-returning function returns only integer values.

6. When passing a variable to a function by reference, changes to the variable in the function affect the value of the variable.

7. The program in Figure A-2:

```
 1 #include <iostream>
 2 using namespace std;
 3
 4 int main()
 5 {   const int SIZE = 4;
 6     float a[SIZE] = { 33.3, 44.4, 55.5, 66.6 };
 7
 8     for (int i=0; i<6; i++)
 9         cout << a[i] << " ";
10
11     return 0;
12 }
```

Figure A-2

would produce the following output:

```
33.3  44.4  55.5  66.6  0.0  0.0
```

8. The following two-dimensional array can store 12 numbers.

```
int array [3][4];
```

9. You can write programs which use subscripts that go beyond the bounds for an array.

10. If you leave an element in an array uninitialized, you do not have to leave all the ones that follow it uninitialized.

SECTION B – STRUCTURED QUESTIONS [Total marks – 55]

There are **FIVE (5)** questions in this section. Write your answers to each question in the answer booklet provided. The marks for each question is as indicated.

Question 1 **[10.5 MARKS]**

a) Write a C++ code segment that utilizes a `for` loop to display even numbers ranging from 25 to 125 which are divisible by 5. (3.5 marks)

b) The program in Figure B-1 is to display the number of positive, negative and zero values. The user will be asked to enter the numbers until he/she decides to stop. Complete the program using the `do/while` loop. (7 marks)

Note: *your answer only needs to provide the statements from lines 9 to 20.*

```
 1  #include<iostream>
 2  using namespace std;
 3  int main()
 4  {   int value;          // value entered by the user
 5      int numPositive=0; // number of positive values
 6      int numNegative=0; // number of negative values
 7      int numZero=0;      // number of zero values
 8      char choice;        // decision to continue or not
 9      _____________________________________________
10      cout<<"Enter a value: ";
11      _____________________________________________
12      _____________________________________________
13      _____________________________________________
14      _____________________________________________
15      _____________________________________________
16      _____________________________________________
17      cout<<"Do you want to Continue(y/n)? ";
18      _____________________________________________
19      _____________________________________________
20      cout<<"Positive count:" << numPositive<< endl;
21      cout<<"Negative count:" << numNegative<< endl;
22      cout<<"Zero count :"    << numZero<< endl;
23
24      system ("PAUSE");
25      return 0;
26  }
27
28
```

Figure B-1

Question 2 **[10 MARKS]**

Given a C++ program as shown in Figure B-2. Answer the question follows:

```
 1 #include <iostream>
 2 #include <cmath>
 3 #include <iomanip>
 4
 5 using namespace std;
 6
 7 void findMe(double a, double b);
 8
 9 int main()
10 {   double first, second;
11
12     cout << "Enter two numbers :";
13     cin >> first >> second;
14     cout << endl;
15
16     findMe(first, second);
17
18     return 0;
19 }
20
21 void findMe(double a, double b)
22 {   double c;
23
24     if (a != 0)
25         c = sqrt(b)/a;
26     else{
27         cout << "Enter a nonzero number: ";
28         cin >> a;
29         cout << endl;
30         c = pow(b,a);
31     }
32
33     cout << fixed << showpoint << setprecision(2);
34     cout << a << ", " << b << ", " << c << endl;
35 }
```

Figure B-2

Trace the executions of the program with the following set of inputs: (10 marks)

Set input #1: **2** **16**
Set input #2: **8** **64**
Set input #3: **0** **25** **1**

Note: *provide the trace table (as shown below) in your answers*

Trace Table:

Set input#	first	second	a	b	c	Output
1						
2						
3						

Question 3 **[10 marks]**

a) Given the definition of a function named **exchange** in Figure B-3.

```
10  void exchange(int &x, int y)
11  {
12       int temp = x;
13       x = y;
14       y = temp;
15  }
```

Figure B-3

Determine whether each of the following calls to the function **exchange** is valid. If it is, write the output printed by the code segment. Otherwise, give the reason why the call is invalid. (4 marks)

i.
```
int p=1, q=2;
exchange(p,q);
cout <<"p:"<<p <<",q:"<<q;
```

ii.
```
int r=3;
exchange(r,10);
cout <<"r:"<<r;
```

iii.
```
int s=4;
exchange(10,s);
cout <<"s:"<<s;
```

iv.
```
int t=5, u=6;
exchange(t,t+u);
cout <<"t:"<<t <<", u:"<<u;
```

b) Using appropriate parameter passing (i.e., by reference or value or a combination of both), write the definitions for the following functions. You also need to determine the parameters that should be used by each function. Then write an example code that shows a correct call to the function. (6 marks)

i. **`biggest`**. This function finds the biggest value from two numbers.

ii. **`increment`**. This function increases the value of a variable by a specified amount. For example, if the value of a variable, `num`, is 10 and we increase it by 5, then its value becomes 15.

Note: *Provide your answer in a table as follow*

No	Function definition	Example of function call
i.		
ii.		

Question 4 **[11.5 marks]**

Write C++ code for each task below. Note that questions 4(a) – (e) are **continuous**.

a) Declare and initialize a 6-element array named `arr` with the following given list of values:

`156, -25, 24` (1 mark)

b) Calculate the difference between the first and fifth elements of the array and assign the value to the last element. (1 mark)

c) Using an appropriate loop, print the contents of all elements in `arr`. (1 mark)

d) Using an appropriate loop, search for and print the minimum value in `arr`. (4.5 marks)

e) Using appropriate loops, reverse the array `arr` so that the content of the first element goes to the last element and vice versa, the content of the second element goes to the second last element and vice versa, and so forth. (3.5 marks)

Question 5 **[13 marks]**

A C++ program that uses and manipulates a two-dimensional integer array of fifty rows and twenty columns is going to be written. Write an appropriate C++ code segment that performs each of the following tasks:

a) Declare the array. (1 mark)

b) Fill in the array with numbers entered by the user. (3 marks)

c) Display the numbers of the first and last columns for each row. (3 marks)

d) Find the row index of the element in the first column that contains the largest number. (5 marks)

e) Based on the row index found in (d), display the largest number. (1 mark)

SECTION C - PROGRAMMING QUESTION [30 marks]

This section consists of **ONE (1)** question only. Write your answer to this question in the answer booklet provided.

Question

The 9-Eleven Mart is a convenience store company operating in the state of Johor. The company has five stores located in several branches; Johor Bahru, Segamat, Batu Pahat, Kota Tinggi and Mersing, respectively. At the end of each year, the management of the company wants to know the performance of their company. They have decided to use a computer program to help them in analyzing the company's sales. You, as a freelance programmer have been appointed to develop the program using C++ language. The requirements of the program are as follow:

Input:

- The program should read in sales data from a text file.
- The name of the input file has to be entered by the user.
- The format of the input file is as follows: The first to twelfth columns indicate the sales for each month, i.e., the first column is for the sales of January, second column is for February, third column is for March, and so forth. The last column indicates store branches. Note that sales in each cell is represented in multiple of RM 1000.00
- Figure C-1 shows an example of input file named "sales2012.txt" containing sales data for the year 2012.

Output:

- The program should print out a report into a text file.
- The name of the output file has to be entered by the user.
- The report should include:
    - The grand total of sales, i.e., over all stores throughout the year.
    - The average sales per month.
    - The highest sales. Print the store, month and the sales whose the highest sales.
    - The total sales for each month. The months should be printed with their abbreviated names, such as, "Jan", "Feb", "Mar", and so forth.

  - The total sales for each store.
  - The list of profitable stores. A store is considered profitable if it manages to achieve minimum annual sales of RM 600,000.00.
- Note that all money values have to be specified as with 2 decimal points, 10 spaces in width, and right-justified.
- Figure C-2 shows an example report file for the sales data of the year 2012.

Arrays:

- The program should use a two-dimensional array to store the sales data.
- The program should also use a one- dimensional array to store the store branches.

Functions:

The program should have the following function:

- **`readFile`**. The purpose of this function is to read the sales data and store branches from an input file , then put the read data into a two-dimensional array (for the sales data), and a one-dimensional array (for the store branches). The file's name and both the arrays have to be accepted as arguments for the function.

- **`grandTotalSales`**. This function should return the grand total of sales over all stores throughout the year. It should accept a two-dimensional array (representing sales) as its arguments.

- **`averageMonthlySales`**. This function should return the company's average sales per month. It should accept a two-dimensional array (representing sales) as its arguments.

- **`monthTotalSales`**. This function should accept a two-dimensional array and the index of a column in the array (representing a month) as its arguments. The function should return the total sales for the specified month.

- **`storeTotalSales`**. This function should accept a two-dimensional array and the index of a row in the array (representing a store branch) as its arguments. The function should return the total sales for the specified branch.

- **`indicesOfHighestSales`**. This function should accept a two-dimensional array (representing sales) as one of its arguments. It should determine the indices of row and column of a cell in the array whose the highest sales.

Write a complete C++ program based on the requirements given above.

```
94  49  96  67  82  34  91  64  15  97  98  78  Johor Bahru
71  57  17  31  63  38  77  74  61  22  27  59  Segamat
36  16  30  19  29  41  23  25  22  37  28  29  Batu Pahat
87  48  49  91  72  69  13  97  43  41  29  58  Kota Tinggi
34  32  74  57  32  80  76  40  64  48  41  68  Mersing
```

Figure C-1: An example of input file, "sales2012.txt"

```
Grand total of sales over all stores: RM 3140000.00
Average sales per month:              RM  261666.67

The highest sales:
-----------------
Store: Johor Bahru
Month: Nov
Sales: RM   98000.00

Total sales by month:
Month   Sales
-----   -----
Jan     RM  322000.00
Feb     RM  202000.00
Mar     RM  266000.00
Apr     RM  265000.00
May     RM  278000.00
Jun     RM  262000.00
Jul     RM  280000.00
Aug     RM  300000.00
Sep     RM  205000.00
Oct     RM  245000.00
Nov     RM  223000.00
Dec     RM  292000.00

Total sales by store:
Store         Total Sales
-----         -----------
Johor Bahru   RM  865000.00
Segamat       RM  597000.00
Batu Pahat    RM  335000.00
Kota Tinggi   RM  697000.00
Mersing       RM  646000.00

Profitable stores:
-----------------
Johor Bahru
Kota Tinggi
Mersing
```

Figure C-2: The output file for the sales data in Figure C-1.