Q1: Concepts and Definitions (30 marks)

1a. What is the difference between an algorithm and a program?

1b. In one sentence each, describe the meaning of each of the following terms:

- Class
- Object
- Method
- Inheritance
- Superclass
- Subclass
- JVM (explain what it is used for)
1c. For each of the following devices, indicate whether it provides temporary, or permanent storage

<table>
<thead>
<tr>
<th>Device</th>
<th>Storage Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROM</td>
<td></td>
</tr>
<tr>
<td>RAM</td>
<td></td>
</tr>
<tr>
<td>Floppy disk</td>
<td></td>
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<tr>
<td>Zip Disk</td>
<td></td>
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<tr>
<td>CD-ROM</td>
<td></td>
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<tr>
<td>Hard disk</td>
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</tbody>
</table>

1d. List any five of the various steps in software development.

1e. List three reasons why you may use the formal software development methodology in program development.

1f. Very briefly, describe the three types of errors you may encounter in a JAVA program (Here, you are required to list the types of error, and state in one or two sentences, what each means).
Q2: True or False Questions. (10 marks)
For each of the following, indicate whether the assertion is TRUE or FALSE.

<table>
<thead>
<tr>
<th>s/n</th>
<th>Assertion</th>
<th>True or False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Every computer program must always display some output on the monitor</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Variables declared as <code>int</code> usually require less storage than those declared as <code>double</code></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>In JAVA, it is illegal to evaluate any operator from right to left.</td>
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<tr>
<td>4</td>
<td>A machine code needs to be translated by a compiler before execution can start.</td>
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<tr>
<td>5</td>
<td>It is not allowed for the left hand side of a Java statement to contain an arithmetic expression or a constant</td>
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<tr>
<td>6</td>
<td>Any valid ASCII character is also a valid symbol for a Java identifier</td>
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</tr>
<tr>
<td>7</td>
<td>The following are all valid data types in Java: <code>int</code>, <code>float</code>, <code>real</code>, <code>char</code>, <code>bool</code></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>In Java, only two control structures are allowed – selection control structures and repetition control structures</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>It is legal to initialize an <code>int</code> type variable at the time it is declared.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>The unary forms of the arithmetic operators <code>+</code>, <code>-</code> always have a higher precedence than the corresponding binary operators</td>
<td></td>
</tr>
</tbody>
</table>

Q3: Program Outputs and Arithmetic Expressions (40 marks)

3a. Given the following declarations, answer the following questions:

```java
int a;
float b;
double c;
```

What will be the data type for the result of the following statements?

```
a + b ;
a/a ;
a + b +c ;
(b+c)/a;
```

3b. Write the JAVA expression for the following:

(i) \[ y = \frac{a - b}{(c - d)d} \]

(ii) \[ Y = \frac{A}{\left(x^2 + 5\right)} - \frac{z}{C^2} \]
4c.
Determine whether each of the following is a valid Java statement.
Assume the identifiers \( x, y, \) and \( z \) are integers.
A. \( \text{int a;} \)
B. \( x + y = z; \)
C. \( \text{const int b : 5;} \)
D. \( a = b \% c; \)

4d.
Assume \( \text{int x;} \)
For each of the following statements, determine the value of \( x \).
A. \( x = 10.0 / 4.0 + 2 * 3; \)
B. \( x = 10 \% 4 + 13 \% 3; \)
C. \( x = 10 / 4 + 13 / 3; \)
D. \( x = 15 \% 6 * 4; \)
E. \( x = 15 \% (6 + 3); \)

4e. List the results that will be produced if the following is executed: (Ignore any syntax error)

```java
public static class SampleProgram
{
    public static void main(String [] args)
    {
        int m, n;
        int average;

        m=5; n=2;

        System.out.print ("The average is: ");
        average = (m+n)/2 ;

        System.out.print (" + average);
        System.out.println (" ");
        System.out.println ("Bye");
    }
}
```
Q5: Writing a Program (15 marks)

Write a program to display the area of certain segment of a quadrant.
The area of the segment from a quadrant of circle is given by:

\[ Area = \frac{\pi R^2}{4} - \frac{R^2}{2} \]

where \( R \) is the radius of the circle, and \( \pi = 3.142 \) is a constant.
The program should accept the height and base from the user, and display the calculated area.

You may use a function if you wish. However, you are NOT required to use functions in your program.