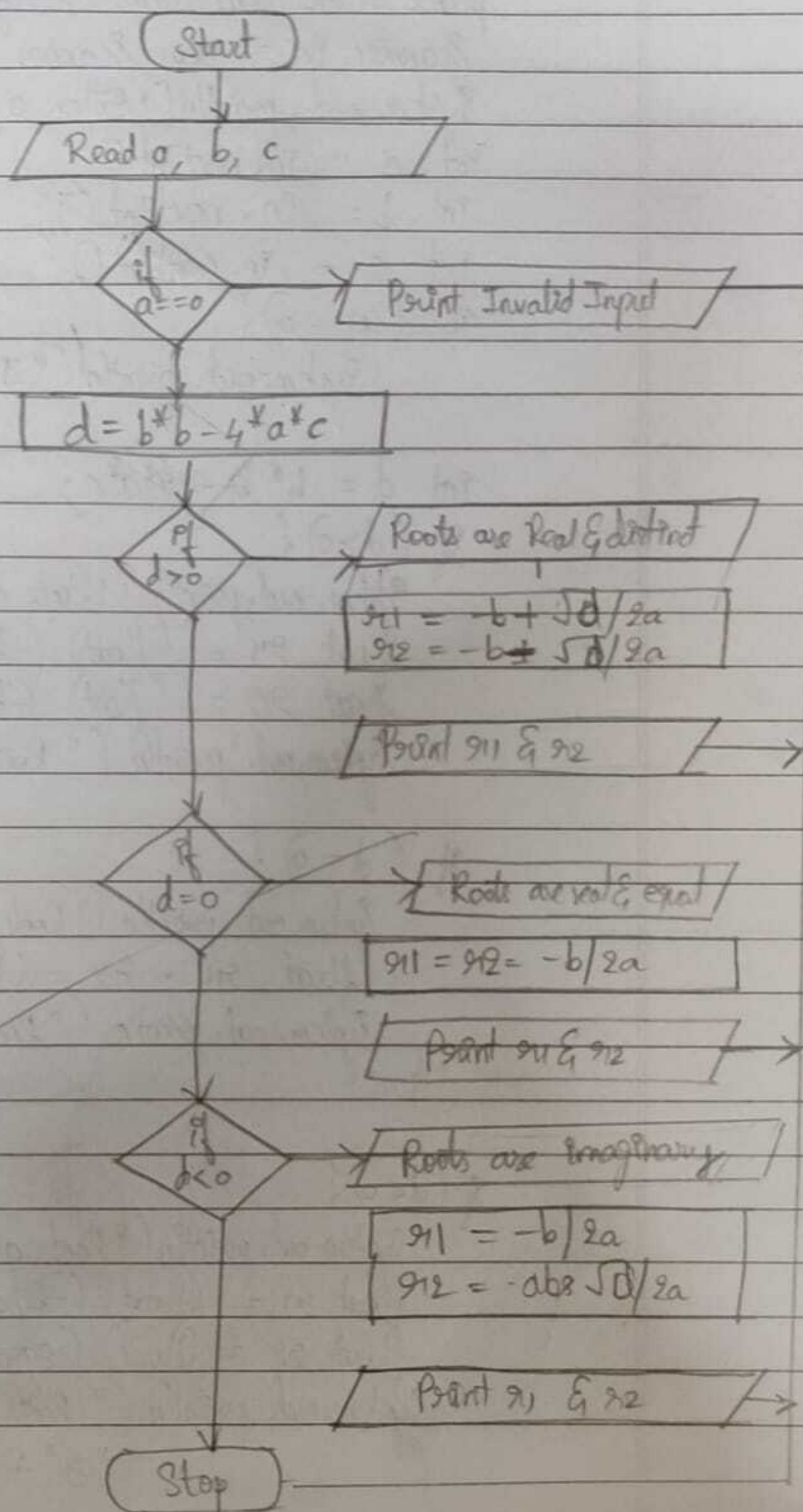Lab Program 1

Q) Develop a Java program that prints all real solutions to quadratic equation $ax^2 + bx + c = 0$

Read in a, b, c and use the quadratic formula. If the discriminate $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.

```
┌──────────┐
│  Start   │
└──────────┘
     │
     ▼
 / Read a, b, c /
     │
     ▼
  < if a==0 > ───────►  / Print Invalid Input /
     │
     ▼
 [ d = b*b - 4*a*c ]
     │
     ▼
  < if d>0 > ───────►  / Roots are Real & distinct /
     │                  [ r1 = -b + √d / 2a
     │                    r2 = -b ± √d / 2a ]
     │                  / Print r1 & r2 / ──►
     ▼
  < if d=0 > ───────►  / Roots are real & equal /
     │                  [ r1 = r2 = -b / 2a ]
     │                  / Print r1 & r2 / ──►
     ▼
  < if d<0 > ───────►  / Roots are imaginary /
     │                  [ r1 = -b / 2a
     │                    r2 = -abs √d / 2a ]
     │                  / Print r1 & r2 / ──►
     ▼
┌──────────┐
│   Stop   │
└──────────┘
```

```java
import java.util.Scanner;
import static java.lang.Math.sqrt;
import static java.lang.Math.abs;

public class QF {
    public static void main (String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.println("Enter a, b & c:");
        int a = in.nextInt();
        int b = in.nextInt();
        int c = in.nextInt();
        if (a==0) {
            System.out.println("Invalid input for a"); }

        int d = b*b - 4*a*c;
        if (d>0) {
            System.out.println("Roots are real & distinct");
            float r1 = (float)(-b+ sqrt(D))/2*a;
            float r2 = (float)(-b- sqrt(D))/2*a;
            System.out.println("Roots are" +r1+ "&" +r2);

        if (d==0) {
            System.out.println("Roots are real & equal");
            float r1 = r2 = (float)(-b/2*a);
            System.out.println("Roots are" +r1 "&" +r2);
        }

        if (d<0) {
            System.out.println("Roots are imaginary");
            float r1 = (float)(-b/2*a);
            float r2 = (float)(sqrt(d))/2*a;
            System.out.println("Roots are" +r1+ "+i" +r2+
                "&" +r1+ "-i" + r2);
```

```
C:\Users\bmsce\Desktop\1BM22CS001>java QE
Enter a,b,c
0
2
3
Aakanksha V R 1BM22CS001
Invalid input for a
```

```
C:\Users\bmsce\Desktop\1BM22CS001>java QE
Enter a,b,c
2
7
1
Aakanksha V R 1BM22CS001
Roots are real and distinct
Roots are-0.5968758 & -13.403124
```

```
C:\Users\bmsce\Desktop\1BM22CS001>java QE
Enter a,b,c
2
4
2
Aakanksha V R 1BM22CS001
Roots are real and equal
Roots are-4.0 & -4.0
```

```
C:\Users\bmsce\Desktop\1BM22CS001>java QE
Enter a,b,c
1
2
3
Aakanksha V R 1BM22CS001
Roots are imaginary
Roots are-1.0+i1.4142135 & -1.0-i1.4142135
```