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Software Testing

Assignment 4

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Contents

Case Study

In a programming competition the students are required to design a program that takes three numbers (a, b, c) as inputs and determine whether the equation is Quadratic or not. The standard form of Quadratic Equation is ax2+bx+c=0, where a, b, c are constants and “a” cannot be zero. The program should have a method that calculates the nature of the roots of the Quadratic equation weather the roots of the equation are Real, Equal or Imaginary using the discriminant b2-4ac. Following are the conditions that should be meet:

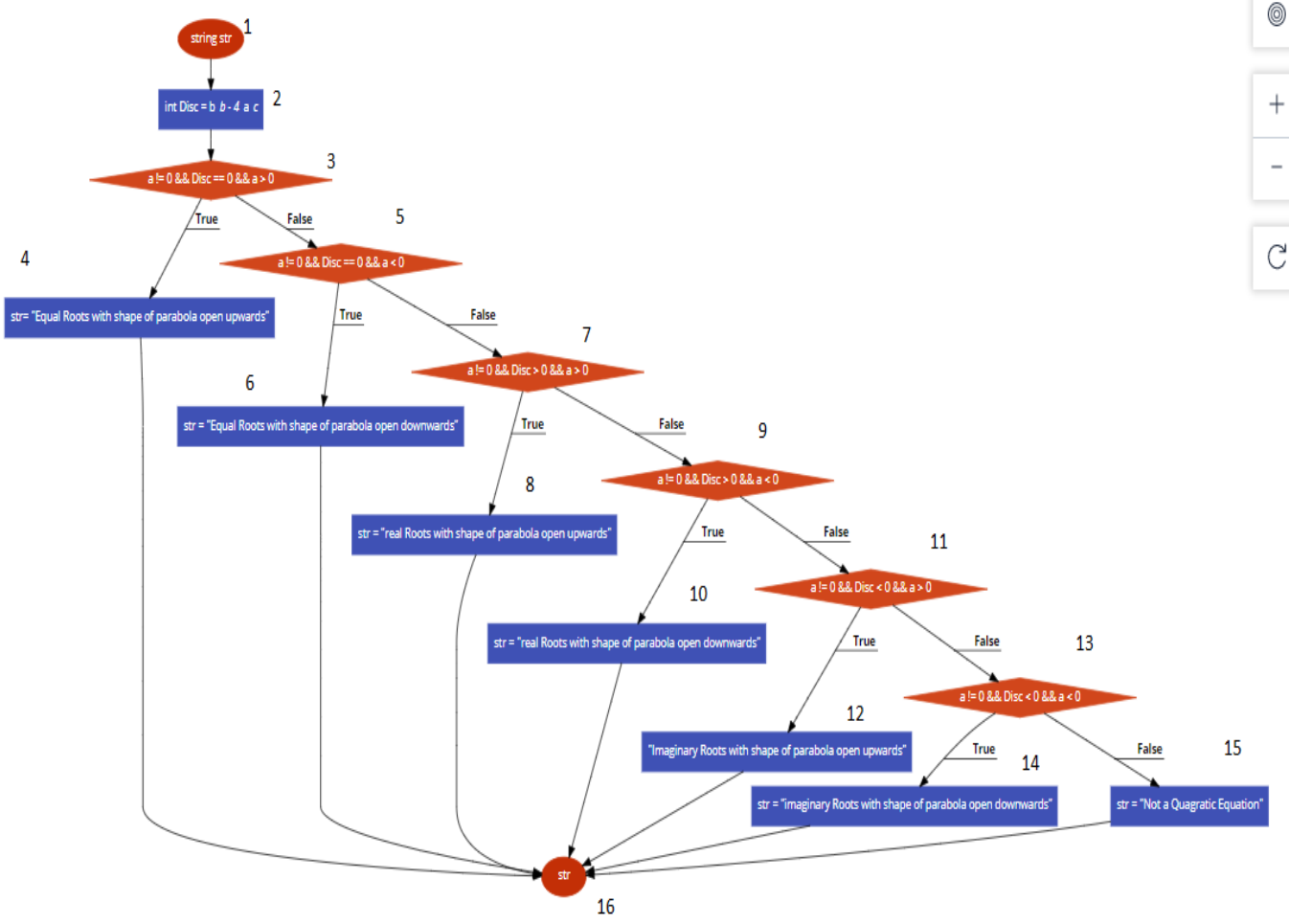
• If b2-4ac>0 the roots are Real and Unequal.

• If b2-4ac=0 the roots are Real and Equal.

• If b2-4ac<0 the roots are Imaginary.

The program also depicts the shape of parabola i.e. (the shape of parabola is upwards or downwards depending on the value of a).

Flow Chart



Modified Condition / Decision Coverage

Sr.No	a	b	c	a != 0 && Disc == 0 && a >= 1
1	F	F	F	F
2	F	F	T	F
3	F	T	F	F
4	F	T	T	F
5	T	F	F	F
6	T	F	T	F
7	T	T	F	F
8	T	T	T	T

Sr.No	a	b	c	a != 0 && Disc == 0 && a <= -1
1	F	F	F	F
2	F	F	T	F
3	F	T	F	F
4	F	T	T	F
5	T	F	F	F
6	T	F	T	F
7	T	T	F	F
8	T	T	T	T

Sr.No	a	b	c	a != 0 && Disc > 0 && a >= 1
1	F	F	F	F
2	F	F	T	F
3	F	T	F	F
4	F	T	T	F
5	T	F	F	F
6	T	F	T	F
7	T	T	F	F
8	T	T	T	T

Sr.No	a	b	c	a != 0 && Disc > 0 && a <= -1
1	F	F	F	F
2	F	F	T	F
3	F	T	F	F
4	F	T	T	F
5	T	F	F	F
6	T	F	T	F
7	T	T	F	F
8	T	T	T	T

Sr.No	a	b	c	a != 0 && Disc < 0 && a <= 1
1	F	F	F	F
2	F	F	T	F
3	F	T	F	F
4	F	T	T	F
5	T	F	F	F
6	T	F	T	F
7	T	T	F	F
8	T	T	T	T

Sr.No	a	b	c	a != 0 && Disc < 0 && a <= -1
1	F	F	F	F
2	F	F	T	F
3	F	T	F	F
4	F	T	T	F
5	T	F	F	F
6	T	F	T	F
7	T	T	F	F
8	T	T	T	T

Note

The highlighted test cases 4,6,7,8 are sufficient for MD/DC and the test cases 1,2,3,5 are redundant.

Path Predicate Expressions

SR.NO	Path Predicate Expression	Path
1.	a!=0 && Disc==0&&a>=1	1-> 2->3->4->16
2.	a!=0 && Disc==0&&a<=-1	1-> 2-> 3->5->6->16
3.	a!=0 && Disc>0&&a>=1	1->2->3->3->7->8->16
4.	a!=0 && Disc>0&&a<=-1	1->2->3->5->7->9->10->16
5.	a!=0 && Disc<0&&a>=1	1->2->3->5->7->9->11->12 ->16
6.	a!=0 && Disc<0&&a<=-1	1->2->3->5->7->9->11->13 ->14->16
7.	a==0	1->2->3->5->7->9->11->13 ->15->16

Test Oracle

Sr.No	Inputs			Path	Actual Output	Expected Output
	a	b	c			
1	1	0	0	1-> 2->3->4->16	Equal Roots with shape of parabola open upwards.	Equal Roots with shape of parabola open upwards.
2	-1	0	0	1-> 2-> 3->5-> 6->16	Equal Roots with shape of parabola open downwards.	Equal Roots with shape of parabola open downwards.
3	1	1	0	1->2->3->3->7->8->16	Real Roots with shape of parabola open upwards**.**	Real Roots with shape of parabola open upwards**.**
4	-1	1	0	1->2->3->5->7->9->10->16	Real Roots with shape of parabola open downwards**.**	Real Roots with shape of parabola open downwards**.**
5	1	1	1	1->2->3->5->7->9->11->12->16	Imaginary Roots with shape of parabola open upwards.	Imaginary Roots with shape of parabola open upwards.
6	-1	-4	-5	1->2->3->5->7->9->11->13->14->16	Imaginary Roots with shape of parabola open downwards**.**	Imaginary Roots with shape of parabola open downwards**.**
7	0	1	1	1->2->3->5->7->9->11->13->15->16	Not a Quadratic Equation	Not a Quadratic Equation