Department of Electrical & Computer Engineering

North South University

Project Report

Project Name: Calculator App

Submitted by: Team - 03

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GitHub Link:
https://github.com/nsuspring2019cse427/Group03

Course: CSE427 (Software Quality Assurance & Testing)

Section: 01

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Submitted to: Shaikh Shawon Arefin Shimon (SAS3)

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Project Description

Introduction

The project is mainly emphasized on implementing the learning outcomes of the academic course **'Software Quality Assurance & Testing (CSE427)'.** In order to meet project checkpoints we selected a simple Calculator App, which was developed in Android platform and further tested it following software testing methodologies. Initially we have implemented the basic and obvious features of a Calculator. Our primary focus was on unit testing the basic features and methods of the app.

Background and Product Context

This calculator app we choose to work with was developed about 5-6 months ago as a test project. This app is based on Android platform and has the basic functionalities (i.e. Addition, Subtraction, Multiplication, and Division) of a calculator. As an Android app we choose to implement its full backend using Java. It has a user interface which seems very simple to its users.

Testing Aspects We Implemented

We have successfully implemented following tasks as testing aspects:

- Unit testing each JAVA methods implemented in the existing project using JUnit.
- Catching the uncaught exception.
- Integration testing.
- Functionality testing.
- Input space partitioning.
- Graph partitioning.
- Fixing out the existing bugs after unit testing.

Tools/Frameworks Used:

- ✓ JUnit 4
- ✓ Android Studio (IDE)
- ✓ Eclipse (IDE)

Input Space Partitioning

Inputs Characteristics:

1) Integers

2) Float

3) Double

There are two approaches to do input space portioning. One is interface-based input domain modeling and another one is functionality-based input domain modeling. We applied interface-based input domain modeling in our project. We first identified our input characteristics & limited each characteristic into single parameters in our code. We listed the values from each characteristic block & used those values to run input space partition test codes in our project. Thus, we wrote 30 test cases & test codes in order to do input space partitioning in the "CalculatorTest.java" file of the project. The tables contain values of each characteristic blocks are given below:

Table 1: Partition of Inputs for all Addition, Subtraction, Multiplication, Division

Partition	Positive	ZERO	Negative
a) Inputs are integers	6, 7, 18, 302, 684, 1248, 39852	0	-6, -18, - 302 -4731, -98432
b) Inputs are floats	6.2f, 57.6f, 872.61f, 1123.5f, 12341.23f	0	-6.2f, -57.6f, -872.61f -7136.87f, -72341.21f
c) Inputs are doubles	2459.432,64936.0003,254.3,54.3 , 500.365697, 10.2556	0	-2459.432, -67395.4323, -6311.501, -321.245

Table 2: Partition for Addition Method

Characteristics	Blocks of Values
i) inputs with integer & double	1000, 100.26
ii) inputs with positive & negative values	32565, -625

Table 3: Partition for Subtraction Method	
Characteristics	**Blocks of Values**
i) inputs with integer & double	10000.648, 200
ii) inputs with positive & negative values	32565, -625

Table 4: Partition for Multiplication Method	
Characteristics	**Blocks of Values**
i) inputs with integer & double	10000.648, 200
ii) inputs with positive & negative values	-24, 649

Table 5: Partition for Division Method	
Characteristics	**Blocks of Values**
i) inputs with numerator zero	0.0, -321.245
ii) inputs with positive & negative double values	16911.365, -250.956

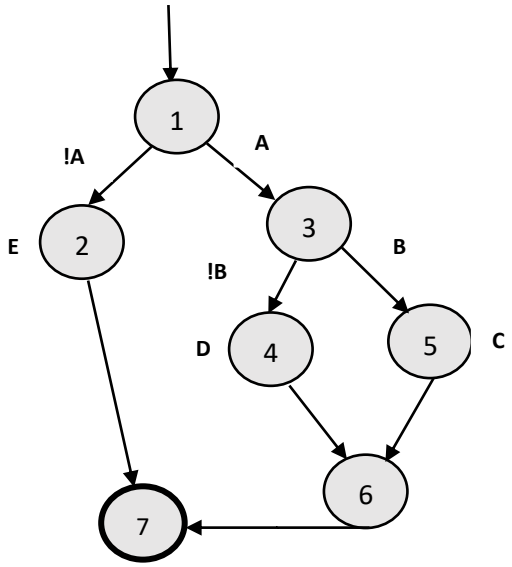
Graph Partitioning

Graph partitioning of the piece of code under the method buttonAddOnClickAction() [line 338 – 354 of MainActivity.java]

```
338  private void buttonAddOnClickAction() {
339
340      try{ <-- A
341          if(screen == null){ <-- B
342              screen.setText(""); <-- C
343          }
344          else{
345              valueOne = Double.parseDouble(screen.getText() + "");
346
347              rAddition = true;
348              screen.setText(null);
349          }
350      } catch(NumberFormatException e) { <--> E
351        Toast.makeText(MainActivity.this,"Wrong ınput",Toast.LENGTH_LONG).show();
352      }
353
354  }
355
```

D

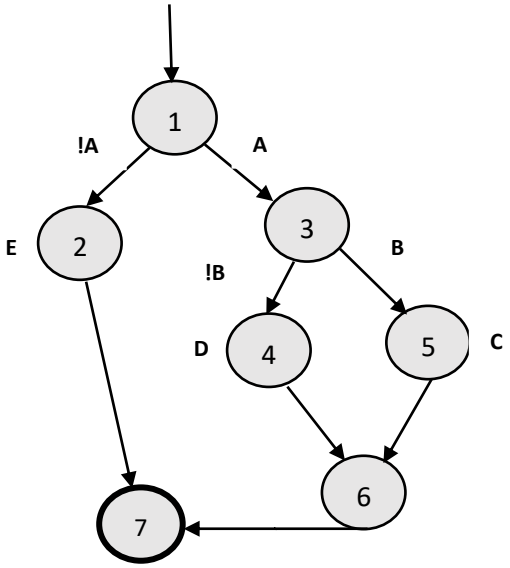
Figure 2: Method buttonAddOnClickAction() with node defined



Graph partitioning of the piece of code under the method buttonMulOnClickAction()

```
369    private void buttonMulOnClickAction() {
370
371        try{                                                    <-- A
372            if(screen == null){                                 <-- B
373                screen.setText("");                             <-- C
374            }
375            else{
376                valueOne = Double.parseDouble(screen.getText() + "");
377
378                rMultiplication = true;                         <-- D
379                screen.setText(null);
380            }
381        } catch(NumberFormatException e) {                      <-- E
382            Toast.makeText(MainActivity.this,"Wrong input",Toast.LENGTH_LONG).show();
383        }
384    }
```

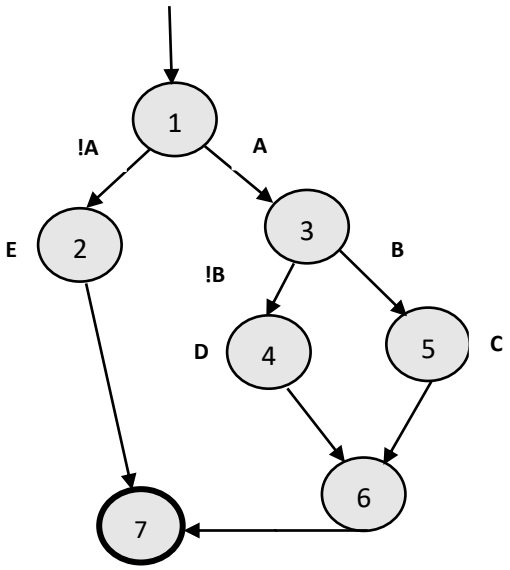
Figure 3: Method buttonMulOnClickAction() with node defined



Graph partitioning of the piece of code under the method buttonDivOnClickAction()

```
386     private void buttonDivOnClickAction() {
387         try{        <-- A
388             if(screen == null){   <-- B
389                 screen.setText("");   <-- C
390             }
391             else{
392                 valueOne = Double.parseDouble(screen.getText() + "")
393
394                 rDivission = true;                                      } D
395                 screen.setText(null);
396             }
397         } catch(NumberFormatException e) {   <--> E
398             Toast.makeText(MainActivity.this,"Wrong Input",Toast.LENGTH_LONG).show();
399         }
400
401
402     }
```

Figure 4: Method buttonDivOnClickAction() with node defined



Node Coverage:

Test Paths	Coverage
t1	[1,2,7]
t2	[1,3,5,6,7]
t3	[1,3,4,6,7]

Test suit T = {t1, t2, t3}

Edge Coverage: Test Paths of Edge coverage are same as Node Coverage for this graph

Edge-Pair Coverage:

Test Paths	Test Requirements that are toured by test paths directly
[1, 2, 7]	[1, 2, 7]
[1, 3, 4, 6, 7]	[1, 3, 4], [3, 4, 6], [4, 6, 7]
[1, 3, 5, 6, 7]	[1, 3, 5], [3, 5, 6], [5, 6, 7]