CS265FZ Software Testing

Lab 6 –Decision Condition Coverage, Multiple Condition Converge and Modified Decision Condition Coverage

There is ONE exercise to be completed.

Two pieces of work need to be submitted:

1. Fill in this lab sheet and submit it to Moodle. You don't need to attach your source code in this form. You need to upload your source code separately.
2. Submit all the required source code to Moodle. Make sure your source code is tested in Eclipse and is executable.

Program 1

The program ***Lab6_Program1*** determines when a service is needed for a car. It has three integer inputs: *miles*; *months*; and *runHours*. The output *serviceNeeded* is either true or false. Engine maintenance is required if it has been running more than 20,000 miles, or at least 12 months, since the last service. However, a service is also required if the engine has run for more than 1,000 hours and it is more than 15,000 miles since the last service. Checking is carried out to prevent the entry of zero or negative numbers for any of the three input parameters.

```
 1 package edu.st.lab6;
 2 public class Lab6_Program1 {
 3     public boolean engineService(int miles, int months, int runHours) {
 4         boolean serviceNeeded = false;
 5         if (miles <= 0 || months <= 0 || runHours <= 0)
 6             serviceNeeded = false;
 7         else {
 8             if (miles > 20000)
 9                 serviceNeeded = true;
10             else if (months > 12)
11                 serviceNeeded = true;
12             else if (runHours > 1000 && miles > 15000)
13                 serviceNeeded = true;
14         }
15         return serviceNeeded;
16     }
17 }
18
```

Figure 1

Task 1

Based on the source code (*as shown in* Figure 1), identify

1) Test Cases
2) Decision Sequences
3) suitable Test Data

for a **Condition Decision Coverage** test for Line 12 (the compound decision only).

Test Case	Condition/Decision
CDC-1	((*runHours* > 1000) && (*miles* > 15000))
CDC-2	! ((*runHours* > 1000) && (*miles* > 15000))
CDC-3	(*runHours* > 1000)
CDC-4	! (*runHours* > 1000)
CDC-5	(*miles* > 15000)
CDC-6	!(*miles* > 15000)

Decision Sequences
Decision Sequences 1: CDC-1 → CDC-3 → CDC-5
Decision Sequences 2: CDC-2 → CDC-3 → CDC-6
Decision Sequences 3: CDC-2 → CDC-4

Test ID	Test Cases Covered	Inputs			Exp. Output
		miles	*runHours*	*months*	*Return value*
T6.1	CDC-1,3,5	15001	1001	1	true
T6.2	CDC-2,[3],6	14999	1001	1	false
T6.3	CDC-2,4	15001	999	1	false

Hint: *the value for the input parameter "months" needs to carefully be chosen so that the statement containing the decision in Line 12 can be reached.*

Task 2

Based on the source code (*as shown in* Figure 1), identify

1) Test Cases
2) Condition Truth Table
3) suitable Test Data

for a **Multiple Condition Coverage** test for Line 12 (the compound decision only).

Test Case	Decision
MCC-1	((*runHours* > 1000) && (*miles* > 15000))
MCC-2	! ((*runHours* > 1000) && (*miles* > 15000))

Truth Table		
Index	(*runHours* > 1000)	(*miles* > 15000)
1	true	true
2	true	false
3	false	true
4	false	false

Test ID	Test Cases Covered	Inputs			Exp. Output
		miles	*runHours*	*months*	*Return value*
T6.1	MCC-1	15001	1001	1	true
T6.2	MCC-2	14999	1001	1	false
T6.3	MCC-3	15001	999	1	false
T6.4	MCC-4	15001	1001	1	false

Hint: *the value for the input parameter "months" needs to carefully be chosen so that the statement containing the decision in Line 12 can be reached.*

Task 3

Based on the result from the **Condition Decision Coverage**, identify

1) Test Cases for Decision, Condition and Effect
2) Truth Table for Effect
3) suitable Test Data for a **Modified Condition Decision Coverage** test

for Line 12 (the compound decision only).

Test Case	**Condition/Decision**
MCDC-1	((*runHours* > 1000) && (*miles* > 15000))
MCDC-2	! ((*runHours* > 1000) && (*miles* > 15000))
MCDC-3	(*runHours* > 1000)
MCDC-4	! (*runHours* > 1000)
MCDC-5	(*miles* > 15000)
MCDC-6	!(*miles* > 15000)

Test Case	**Effect**
MCDC-7	Effect of (*runHours* > 1000) on result
MCDC-8	Effect of (*miles* > 15000) on result

Truth Table				
Index	(*runHours* > 1000)	(*miles* > 15000)	(*months* <= 12)	Output
1	true	true	true	true
2	true	false	true	false
3	false	true	true	false
4	false	false	true	false

Test ID	**Test Cases Covered**	**Inputs**			**Exp. Output**
		miles	*runHours*	*months*	*Return value*
T6.1	MCDC-1,3,5,7,8	15001	1001	1	true
T6.2	MCDC-2,3,[6],7	14999	1001	1	false
T6.3	MCDC-[2],4,[5,8]	15001	999	1	false

Hint: *the value for the input parameter "months" needs to carefully be chosen so that the statement containing the decision in Line 12 can be reached.*

Task 4

Based on the results from Task 1, 2 and 3 (consider test data from Condition Decision Coverage, Multiple Condition Coverage and Modified Condition Decision Coverage), write your testing code in JUnit 5 to test the source code of the program provided on Moodle ("***Lab6_Program1.java***"). Make sure your test code is named as "***Lab6_Task4.java***". (Hint: duplicated tests should NOT be included; use only ONE test method in the test code.).