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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.

The source code of the program is shown in Figure 1.

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| Text, timeline  Description automatically generated  **Figure 1** |

* ***Task 1:***

Based on the source code (*as shown in* Figure 1), identify 1). Test Cases, 2). Decision Sequences and 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) |

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| **Decision Sequences:**   1. CDC-1 🡪 CDC-3 🡪 CDC-5 2. CDC-2 🡪 CDC-4 🡪 CDC-6 |

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| **Test ID** | **Test Cases Covered** | **Inputs** | | | **Exp. Output** |
| ***miles*** | ***runHours*** | ***months*** | ***Return value*** |
| T1.1 | CDC-1, 3, 5 | 18000 | 2000 | 6 | true |
| T1.2 | CDC-2, 4, 6 | 7000 | 500 | 6 | 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 and 3). suitable Test Data for a **Multiple** **Condition Coverage** test for **Line 12 (the compound decision only).**

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| --- | --- |
| **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*** |
| T2.1 | MCC-1-1 | 18000 | 2000 | 6 | True |
| T2.2 | MCC-2-2 | 7000 | 2000 | 6 | False |
| T2.3 | MCC-2-3 | 18000 | 500 | 6 | False |
| T2.4 | MCC-2-3 | 7000 | 500 | 6 | 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 and 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) |

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

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| --- | --- | --- | --- | --- |
| 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*** |
| T3.1 | MCDC-1, 3, 5, **7, 8** | 18000 | 2000 | 6 | true |
| T3.2 | MCDC-2, 4, 6 | 7000 | 500 | 6 | false |
| T3.3 | MCDC-[2], [4], [5], **7** | 18000 | 500 | 6 | false |
| T3.4 | MCDC-[2], [3], [6], **8** | 7000 | 2000 | 6 | false |

**NOTE:** *for T3.3 and T3.4, MCDC-7 (without [2], [4], [5]) and MCDC-8 (without [2], [3], [6]) are also correct.*

* ***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.).