Assignment 1

Task 1

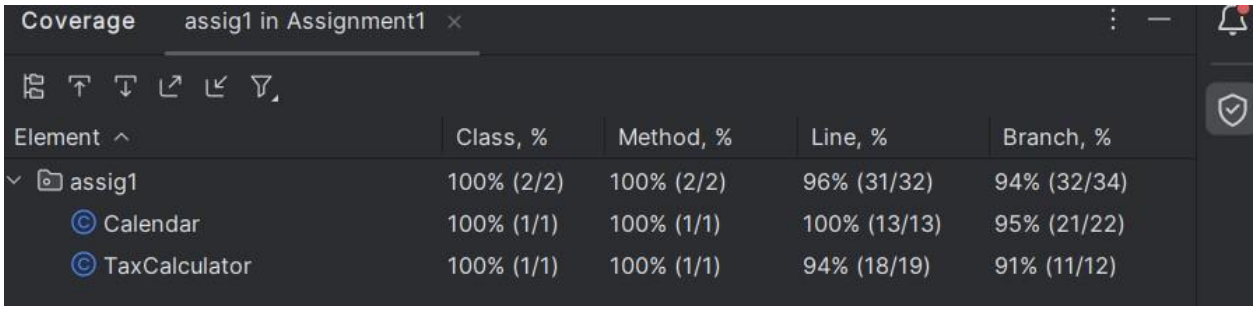

Fig : Code Coverage Junit5

Pit Test Coverage Report

Package Summary

assig1

Number of Classes	Line Coverage		Mutation Coverage		Test Strength	
2	91%	32/35	73%	24/33	75%	24/32

Breakdown by Class

Name	Line Coverage		Mutation Coverage		Test Strength	
Calendar.java	93%	14/15	81%	13/16	81%	13/16
TaxCalculator.java	90%	18/20	65%	11/17	69%	11/16

Report generated by PIT 1.15.8

Fig 2 : Pit Test Coverage Report

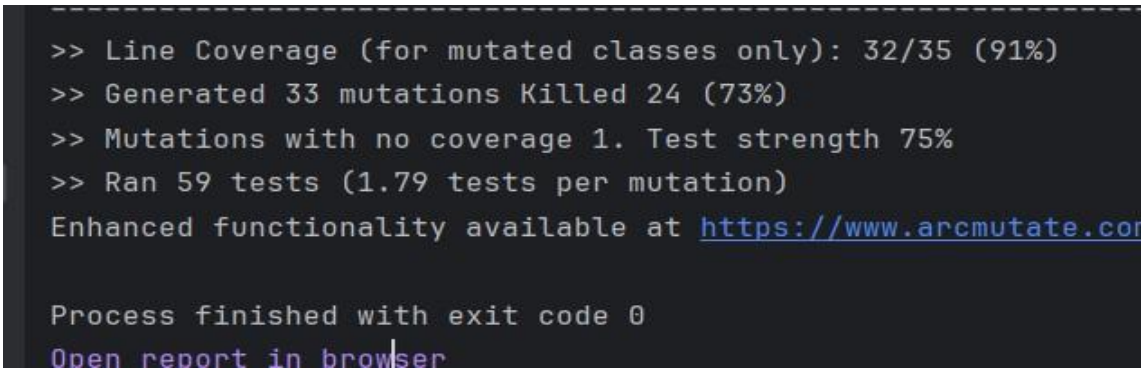

Fig 3: Mutation report

Task 2

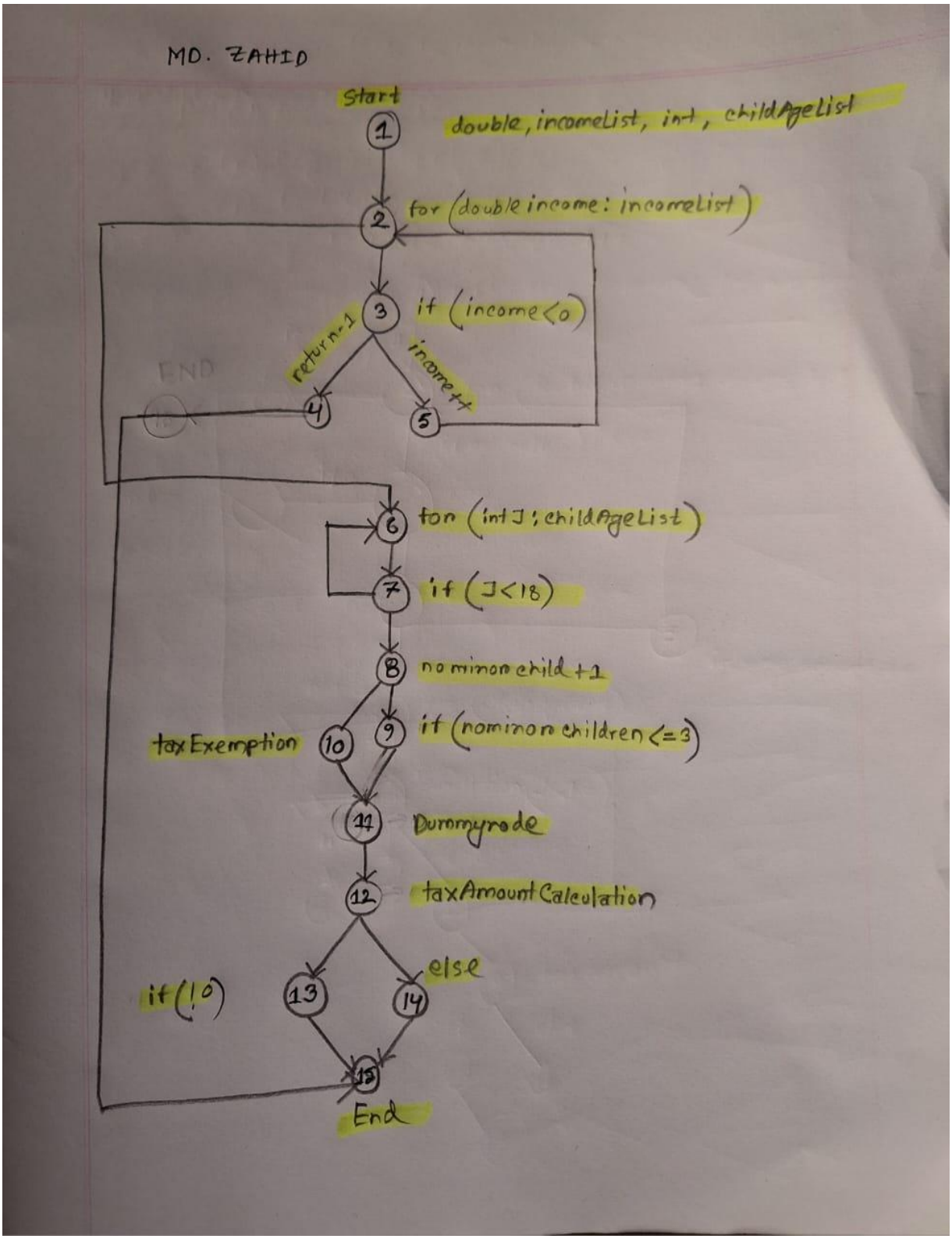

Fig: CFG Diagram

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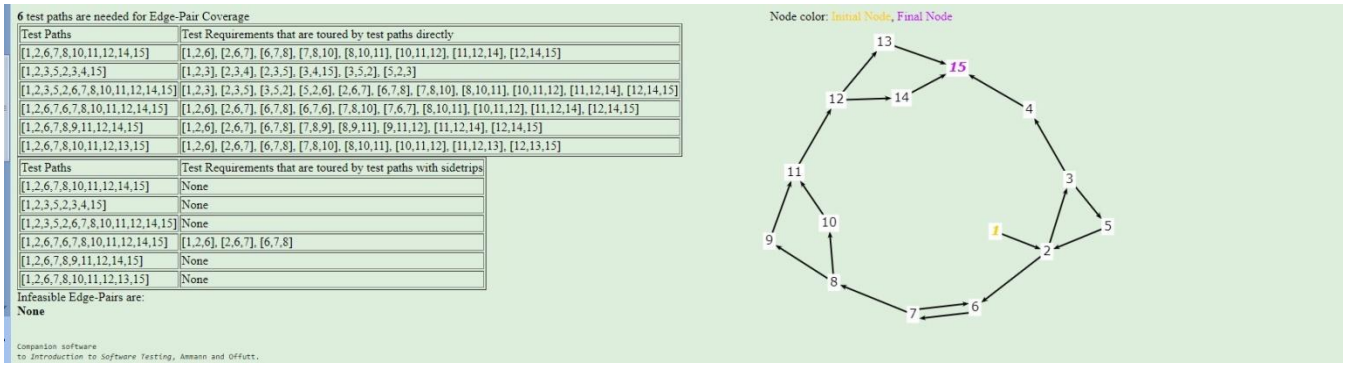

6 test paths are needed for Edge-Pair Coverage

Test Paths	Test Requirements that are toured by test paths directly
[1,2,6,7,8,10,11,12,14,15]	[1,2,6], [2,6,7], [6,7,8], [7,8,10], [8,10,11], [10,11,12], [11,12,14], [12,14,15]
[1,2,3,5,2,3,4,15]	[1,2,3], [2,3,4], [2,3,5], [3,4,15], [3,5,2], [5,2,3]
[1,2,3,5,2,6,7,8,10,11,12,14,15]	[1,2,3], [2,3,5], [3,5,2], [5,2,6], [2,6,7], [6,7,8], [7,8,10], [8,10,11], [10,11,12], [11,12,14], [12,14,15]
[1,2,6,7,6,7,8,10,11,12,14,15]	[1,2,6], [2,6,7], [6,7,8], [6,7,6], [7,8,10], [7,6,7], [8,10,11], [10,11,12], [11,12,14], [12,14,15]
[1,2,6,7,8,9,11,12,14,15]	[1,2,6], [2,6,7], [6,7,8], [7,8,9], [8,9,11], [9,11,12], [11,12,14], [12,14,15]
[1,2,6,7,8,10,11,12,13,15]	[1,2,6], [2,6,7], [6,7,8], [7,8,10], [8,10,11], [10,11,12], [11,12,13], [12,13,15]

Test Paths	Test Requirements that are toured by test paths with sidetrips
[1,2,6,7,8,10,11,12,14,15]	None
[1,2,3,5,2,3,4,15]	None
[1,2,3,5,2,6,7,8,10,11,12,14,15]	None
[1,2,6,7,6,7,8,10,11,12,14,15]	[1,2,6], [2,6,7], [6,7,8]
[1,2,6,7,8,9,11,12,14,15]	None
[1,2,6,7,8,10,11,12,13,15]	None

Infeasible Edge-Pairs are:
None

Companion software
to *Introduction to Software Testing*, Ammann and Offutt.

Node color: Initial Node, Final Node

Fig 4: Edge Pair Coverage

4 test paths are needed for Edge Coverage
[1,2,6,7,8,10,11,12,13,15]
[1,2,3,5,2,3,4,15]
[1,2,6,7,6,7,8,10,11,12,14,15]
[1,2,6,7,8,9,11,12,14,15]

Node color: Initial Node, Final Node

Fig 5: Edge Coverage

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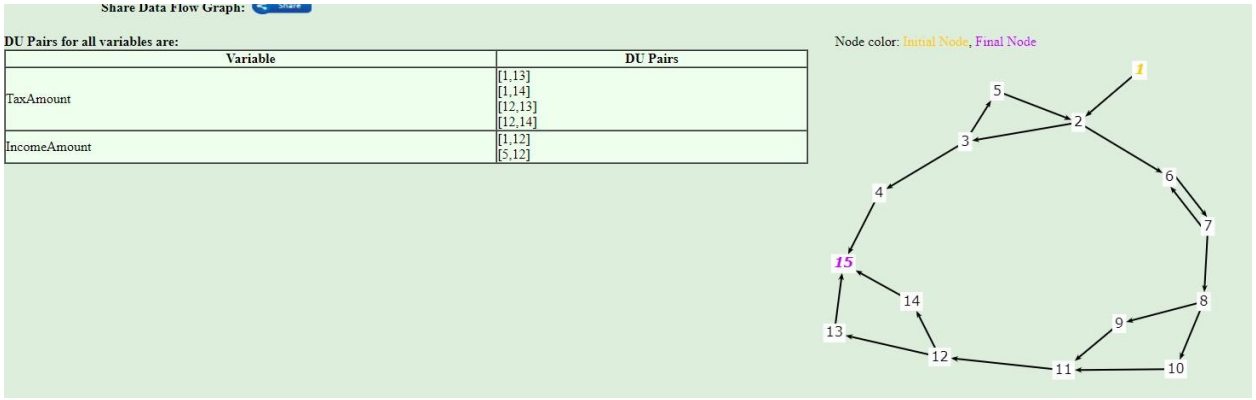

Share Data Flow Graph:

DU Pairs for all variables are:

Variable	DU Pairs
TaxAmount	[1,13] [1,14] [12,13] [12,14]
IncomeAmount	[1,12] [5,12]

Node color: Initial Node, Final Node

Fig 6 : DU-pairs for variables taxAmount and incomeAmount

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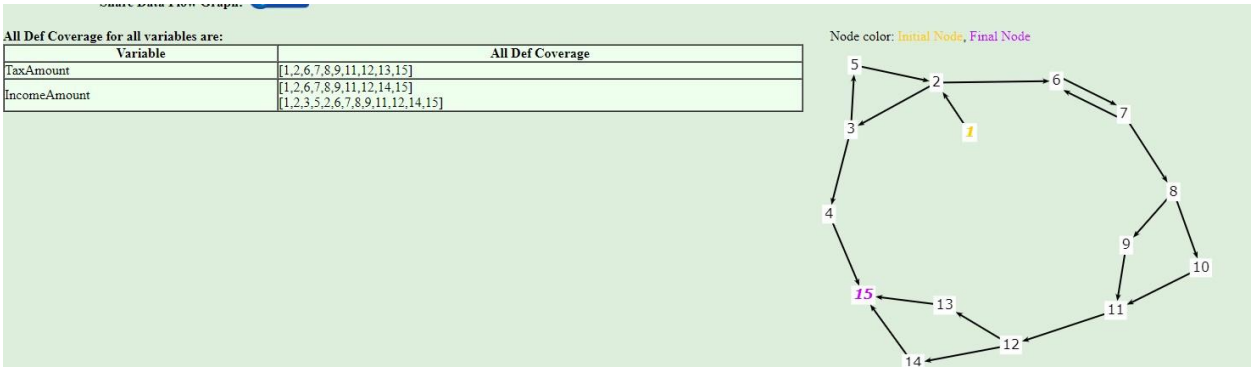

All Def Coverage for all variables are:

Variable	All Def Coverage
TaxAmount	[1,2,6,7,8,9,11,12,13,15]
IncomeAmount	[1,2,6,7,8,9,11,12,14,15] [1,2,3,5,2,6,7,8,9,11,12,14,15]

Fig 7: All Def Coverage

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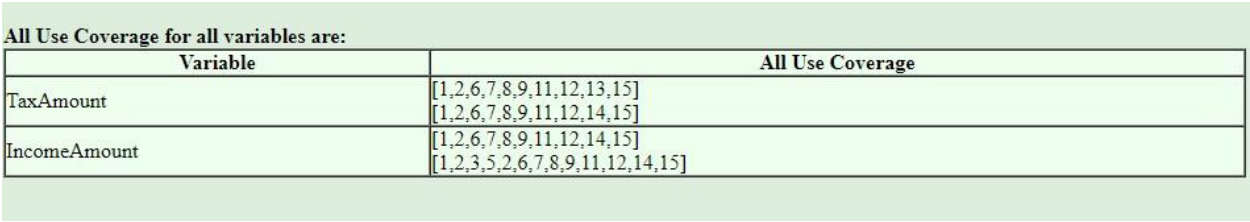

All Use Coverage for all variables are:

Variable	All Use Coverage
TaxAmount	[1,2,6,7,8,9,11,12,13,15] [1,2,6,7,8,9,11,12,14,15]
IncomeAmount	[1,2,6,7,8,9,11,12,14,15] [1,2,3,5,2,6,7,8,9,11,12,14,15]

Fig 8:All Uses Coverage

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Node	Predicate	Reachability
3	P1 = (income < 0)	True
7	P2 = (j < 18)	P1 = false for all incomes in incomeList
9	P3 = (noMinorChildren <= 3)	P1 = false for all incomes in incomeList and P2 = true for at least one child in childAgeList
13	P4 = (taxAmount > 0)	P1 = false for all incomes in incomeList and P2 has been evaluated for all children in childAgeList

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For the predicate if (noMinorChildren <= 3) on line 36, the test requirements for Predicate Coverage would be:

- Test Case 1: Where the condition (noMinorChildren <= 3) is true. This can be achieved by having a childAgeList with 3 or fewer children under the age of 18. This will test the scenario where the tax exemption of 4000 per child is applied.
- Test Case 2: Where the condition (noMinorChildren <= 3) is false. This can be achieved by having a childAgeList with more than 3 children under the age of 18. This will test the scenario where the tax exemption of 3000 per child is applied for the 4th child and onwards.

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This Test Path are created using Prefix Graph Algorithm

Test	Test Path In Graph	Input	Expected Output	EC	EPC	PC
T1	[1,2,3,5,2,6,7,8,9,11,12,14,15]	50,-1	-1	YES	YES	YES
T2	[1,2,3,5,2,3,5,2,3,4,15]	-1	-1	YES	YES	NO
T3	[1,2,6,7,6,7,8,10,11,12,13,15]	50	Tax amount	YES	YES	YES
T$	[1,2,3,4,15]	-1	-1	YES	YES	NO

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Test	Test Path In Graph	Input 1 (Income)	Input 2 ChildAge	Expected Output
T1	[1,2,3,5,2,6,7,8,9,11,12,14,15]	50000,10000	2,4,6,8	Tax amount based on Input
T2	[1,2,3,5,2,3,5,2,3,4,15]	-1	2,4,6	-1
T3	[1,2,6,7,6,7,8,10,11,12,13,15]	50000	2,4,6,	Tax amount based on Input
T$	[1,2,3,4,15]	-1	2,4,6,8	-1

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I wrote the test case in file name TestTask2 in Intellij Idea

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