SENG3320/6320 Software Verification and Validation

Semester 1, 2022  
SENG 3320 Assignment 1 Test Report

Test environment:   
  
Task1: Blackbox Testing  
Test objective:  
  
test cases:   
  
test results:  
  
test coverage:

Task2: White-box Testing: Structural Testing  
Test objective:  
  
test cases:   
  
test results:  
  
test coverage:

Task3: White-box Testing: Data Flow Testing   
  
Method: public BigInteger gcd(BigInteger y)



1. Identify all the definition-use pairs (du-pairs) (5 marks)

Identifying du-pairs – variable **xval** :  
  
all-defs: 1, 8, 9  
all-uses:3, <3,5>, <3,6>, 6, <6,7>, <6,8>, 7, <7,9>, <7,10>, 9 , 12 , 16  
dcu(xval,1) = {9,12,16} dpu(xval,1) = {3,<3,5>, <3,6>, 6, <6,7>,<6,8>, 7, <7,9>, <7,10>,16}  
dcu(xval,8) = {16} dpu(xval,8) = {16}  
dcu(xval,9) = {12} dpu(xval,9) = {}

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| Du-pair | Path(s) |
| (1, 9) | <1,2,3,6,7,9> |
| (1,12) | <1,2,3,6,7,10,12> |
|  | <1,2,3,6,7,10,11,12> |
| (1,16) | <1,2,4,16> |
|  | <1,2,4,13,15,16> |
| (1,3) | <1,2,3> |
| (1, <3,5>) | <1,2,3,5> |
| (1, <3,6>) | <1,2,3,6> |
| (1,6) | <1,2,3,6> |
| (1, <6,7>) | <1,2,3,6,7> |
| (1, <6,8>) | <1,2,3,6,8> |
| (1,7) | <1,2,3,6,7> |
| (1, <7,9>) | <1,2,3,6,7,9> |
| (1, <7,10>) | <1,2,3,6,7,10> |
| (8, 16) | <8,4,16> |
|  | <8,4,13,15,16> |
| (9,12) | <9,10,12> |
|  | <9,10,11,12> |

Identifying du-pairs – variable **yval** :  
  
all-defs:1,11,15  
all-uses: 6, <6,7>, <6,8>, 10, <10,11>, <10,12>, 11,12, 13, <13,14>, <13,15> ,16  
dcu(xval,1) = {11,12,16} dpu(xval,1) = {6, <6,7>, <6,8>, 10, <10,11>, <10,12> , 13, <13,14>, <13,15> ,16}  
dcu(xval,11) = {12} dpu(xval,11) = {}  
dcu(xval,15) = {16} dpu(xval,1) = {16}

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| Du-pair | Path(s) |
| (1,11) | <1,2,3,6,7,10,11> |
|  | <1,2,3,6,7,9,10,11> |
| (1,12) | <1,2,3,6,7,10,12> |
|  | <1,2,3,6,7,9,10,12> |
| (1,16) | <1,2,4,16> |
|  | <1,2,3,6,8,4,16> |
| (1,6) | <1,2,3,6> |
| (1, <6,7>) | <1,2,3,6,7> |
| (1, <6,8>) | <1,2,3,6,8> |
| (1, 10) | <1,2,3,6,7,10> |
|  | <1,2,3,6,7,9,10> |
| (1, <10,11>) | <1,2,3,6,7,10,11> |
|  | <1,2,3,6,7,9,10,11> |
| (1, <10,12>) | <1,2,3,6,7,10,12> |
|  | <1,2,3,6,7,9,10,12> |
| (1,13) | <1,2,4,13> |
|  | <1,2,3,6,8,4,13> |
| (1, <13,14>) | <1,2,4,13,14> |
|  | <1,2,3,6,8,4,13,14> |
| (1, <13,15>) | <1,2,4,13,15> |
|  | <1,2,3,6,8,4,13,15> |
| (11,12) | <11,12> |
| (15,16) | <15,16> |

2) Design test cases to achieve All-Defs coverage (4 marks)   
 t1: 1,2,3,6,7,9,10,11,12 (covered xval definition: 1, 9 and yval definition: 1, 11)  
 t2: 1,2,3,6,8,4,13,15,16,17(covered xval definition: 1, 8 and yval definition: 1, 15)  
  
 test cases t1 and t2 will achieve all-defs coverage for both xval and yval.

3) Design test cases to achieve All-Uses coverage (6 marks)   
 t1: <1,2,3,6,7,9,10,11,12>  
 t2: <1,2,3,6,7,10,12>  
 t3: <1,2,3,6,7,9,10,12>  
 t4: <1,2,3,6,7,10,11,12>  
 t5: <1,2,3,6,8,4,13,15,16,17>  
 t6: <1,2,3,5>  
 t7: <1,2,3,6,8,4,13,14>

t8: <1,2,4,13,15,16,17>  
 t9: <1,2,4,16,17>  
 t10: <1,2,4,13,14>

t11: <1,2,3,6,8,4,16>  
 considerate the test cases executing paths that will achieve All-Uses coverage  
   
 t1: (x = -8, y = -12) expect outcome: 4  
 t2: (x = 8, y = 12) expect outcome: 4  
 t3: (x = -5, y = 25) expect outcome: 5

t4: (x = 3, y = -9) expect outcome: 3

t5: (x = 24, y =-2147483648) expect outcome: 8

t6: (x = 0, y = 100) expect outcome: 100

t7: (x = -2147483648, y =0) expect outcome: 2147483648

t8: (x= 68719476751, y = 23) expect outcome: 23

t9: (x= 695784701952, y = 36590037911583) expect outcome: 3

t10: (x = 1039382085632, y =0) expect outcome: 1039382085632

t11: (x = 11583, y =36590037911583) expect outcome: 39

4) Write and execute the test cases in JUnit. (3 marks)

# work performed by each group member:

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| Tasks | Completion Date | Member |
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| Initial Required classes of the entire Java project | 01/04/2022 | Ni Zeng |
| Initial test report template | 01/04/2022 |
| Task3:  public BigInteger gcd(BigInteger y) |  |
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|  |  | Austin Baxter |
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|  |  | Brandon Allen |
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|  |  | Kelsey Baker |
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