Assignment 8

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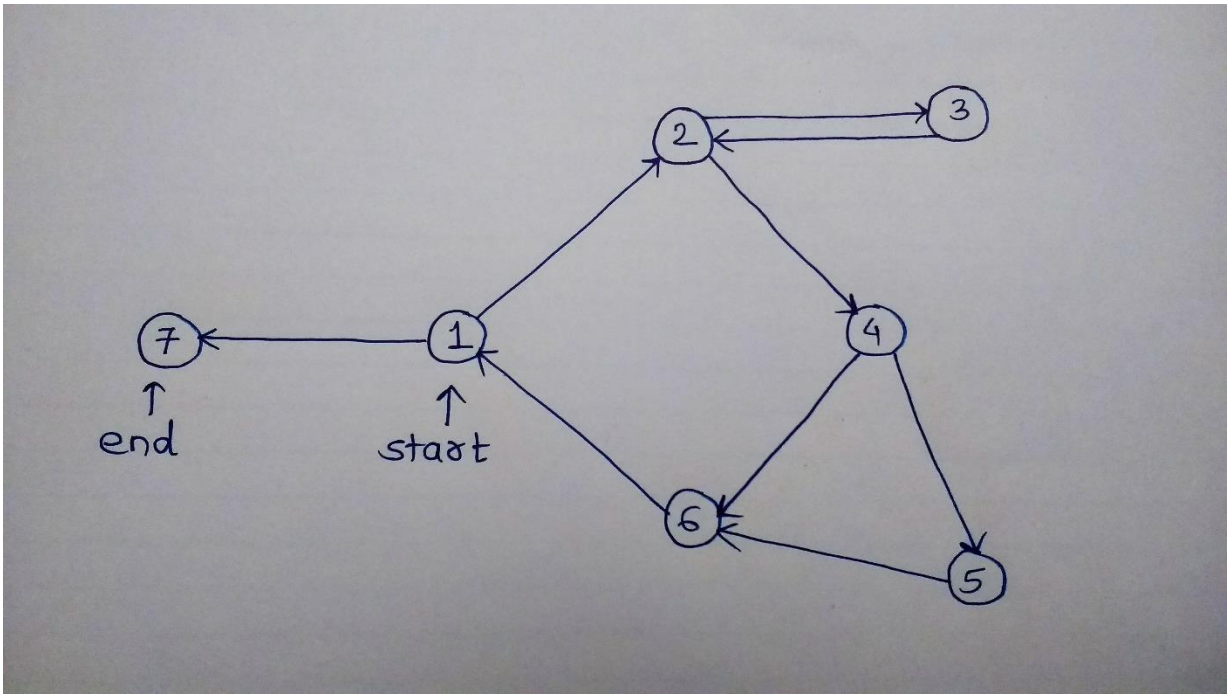
Introduction to Software Testing (Edition 2): Book by Jeff Offutt and Paul Amman
Exercises 7.2.2, Number 5(a-g):

N = {1, 2, 3, 4, 5, 6, 7}
N0 = {1}
Nf = {7}
E = {(1,2),(1,7),(2,3),(2,4),(3,2),(4,5),(4,6),(5,6),(6,1)}

Test paths:
p1 = [1, 2, 4, 5, 6, 1, 7]
p2 = [1, 2, 3, 2, 4, 6, 1, 7]
p3 = [1, 2, 3, 2, 4, 5, 6, 1, 7]

a. Draw the graph



b. Test requirements for Edge-Pair Coverage

Edge Coverage: TR = { (1,2,3), (1,2,4),
(2,3,2), (2,4,6), (2,4,5),
(3,2,3), (3,2,4),
(4,6,1), (4,5,6),
(5,6,1),
(6,1,7), (6,1,2) }

c. Does given set of test paths satisfy Edge-Pair Coverage

Test path p1 = [1, 2, 4, 5, 6, 1, 7]
=> This path covers (1,2,4), (2,4,5), (4,5,6), (5,6,1), (6,1,7)

Test path p2 = [1, 2, 3, 2, 4, 6, 1, 7]
=> This path covers (1,2,3), (2,3,2), (3,2,4), (2,4,6), (4,6,1), (6,1,7)

Test path p3 = [1, 2, 3, 2, 4, 5, 6, 1, 7]
=> This path covers (1,2,3), (2,3,2), (3,2,4), (2,4,5), (4,5,6), (5,6,1) ,(6,1,7)

However, two edge pairs (3,2,3) and (6,1,2) are missing and not covered by any of the test path.

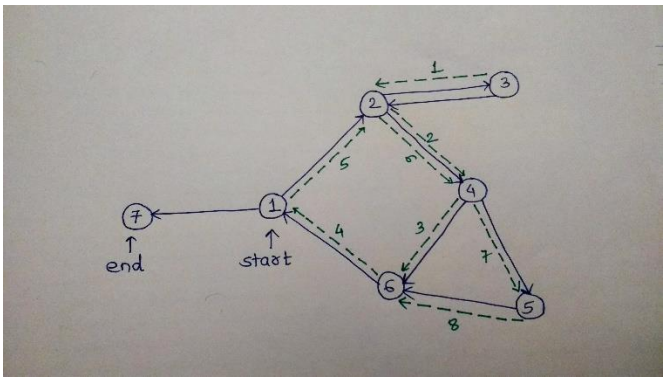
Thus, given set of test paths does not satisfy Edge-Pair Coverage.

d. Simple path [3, 2, 4, 5, 6] and Test path [1, 2, 3, 2, 4, 6, 1, 2, 4, 5, 6, 1, 7].

A test path p tours subpath q if q is a subpath of p.
A test path p tours subpath q with sidetrips iff every edge in q is also in p in the same order.

=> Test Path does not tour Simple path directly.

=> Test path tours Simple path with sidestrip {4, 6, 1, 2, 4}



e.

TR for Node Coverage = {1, 2, 3, 4, 5, 6, 7}
Test paths: [1, 2, 3, 2, 4, 5, 6, 1, 7]

TR for Edge Coverage = { (1,2), (1,7),
(2,3), (2,4) ,
(3,2),
(4,5), (4,6),
(5,6),
(6,1)
}
Test paths: [1, 2, 3, 2, 4, 6, 1, 7], [1, 2, 4, 5, 6, 1, 7]

TR for Prime Path Coverage = { (1,2,4,6,1), (1,2,4,5,6,1),
(2,3,2), (2,4,6,1,2), (2,4,5,6,1,2),
(3,2,3), (3,2,4,6,1,7), (3,2,4,5,6,1,7),
(4,5,6,1,2,4), (4,5,6,1,2,3), (4,6,1,2,4), (4,6,1,2,3),
(5,6,1,2,4,5),
(6,1,2,4,6), (6,1,2,4,5,6)
}

f. Test paths that achieve Node Coverage but not Edge Coverage

Test path p3 = [1, 2, 3, 2, 4, 5, 6, 1, 7] achieves Node Coverage but not Edge Coverage.

g. Test paths that achieve Edge Coverage but not Prime Path Coverage

p1 = [1, 2, 4, 5, 6, 1, 7]
p2 = [1, 2, 3, 2, 4, 6, 1, 7]

p1 and p2 together achieve Edge Coverage but not Prime Path Coverage.

p2 = [1, 2, 3, 2, 4, 6, 1, 7]
p3 = [1, 2, 3, 2, 4, 5, 6, 1, 7]

p2 and p3 together achieve Edge Coverage but not Prime Path Coverage.

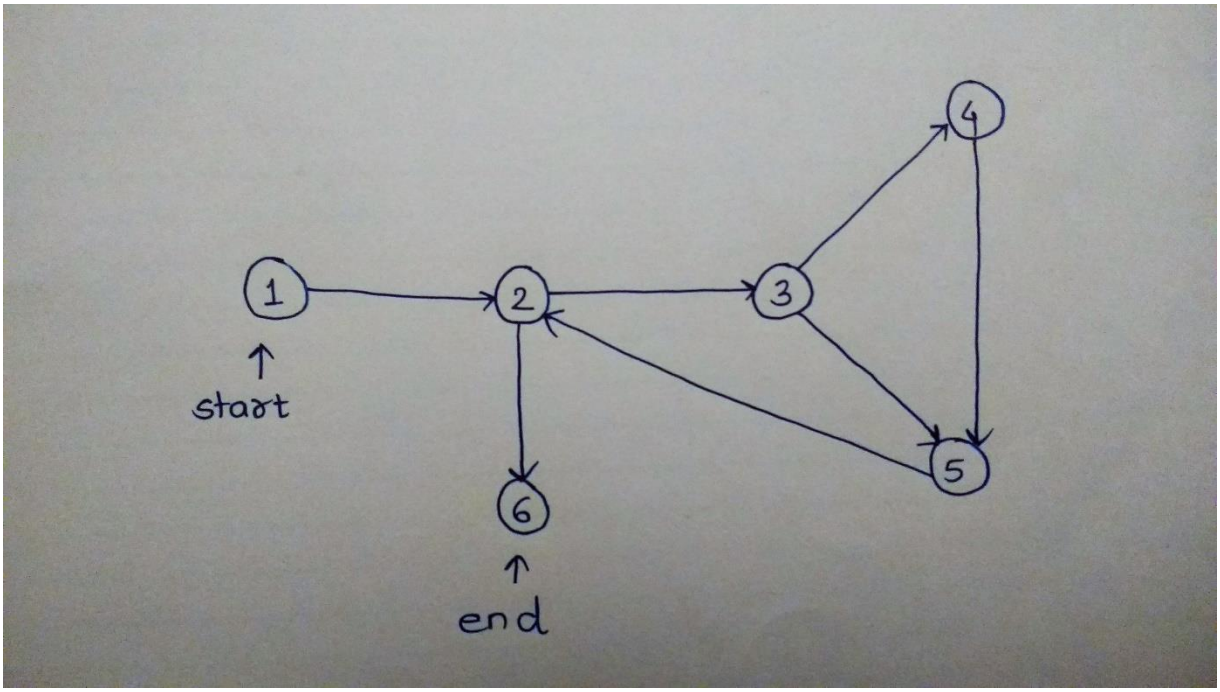
Exercises Section 7.2.3, Number 1(a-f), Graph II only:

N = {1, 2, 3, 4, 5, 6}
N0 = {1}
Nf = {6}
E = {(1,2), (2,3), (2,6), (3,4), (3,5), (4,5), (5,2)}

def(1) = def(3) = use(3) = use(6) = {x}
// Assume the use of x in 3 precedes the def

Test Paths:
t1 = [1, 2, 6]
t2 = [1, 2, 3, 4, 5, 2, 3, 5, 2, 6]
t3 = [1, 2, 3, 5, 2, 3, 4, 5, 2, 6]
t4 = [1, 2, 3, 5, 2, 6]

a. Draw the graph



b. du-paths with respect to x

D-U Pairs: [1,3], [1,6], [3,3], [3,6]

D-U Paths: [1,2,6], [1,2,3],
[3,5,2,3], [3,5,2,6], [3,4,5,2,3], [3,4,5,2,6]

c.

A test path p tours subpath q if q is a subpath of p.

Test Path	D-U paths toured
t1 = [1, 2, 6]	[1, 2, 6]
t2 = [1, 2, 3, 4, 5, 2, 3, 5, 2, 6]	[1,2,3], [1, 2, 6], [3,5,2,6], [3,4,5,2,3], [3,4,5,2,6]
t3 = [1, 2, 3, 5, 2, 3, 4, 5, 2, 6]	[1,2,3], [1, 2, 6], [3,5,2,3], [3,5,2,6], [3,4,5,2,6]
t4 = [1, 2, 3, 5, 2, 6]	[1,2,3], [1, 2, 6], [3,5,2,6]

d. Minimal test set that satisfies all defs coverage with respect to x. (Direct tours only.)

t2 = [1, 2, 3, 4, 5, 2, 3, 5, 2, 6]

This test path satisfies all defs by touring atleast one path for atleast one use for each def. (Paths toured are: [1,2,3], [3,5,2,6])

e. Minimal test set that satisfies all uses coverage with respect to x. (Direct tours only.)

t1 = [1, 2, 6]
t2 = [1, 2, 3, 4, 5, 2, 3, 5, 2, 6]

These two test paths together satisfy all uses coverage by touring atleast one path for each def-use pair.
(Paths toured are: [1,2,3], [1,2,6], [3,4,5,2,3], [3,5,2,6])

f. Minimal test set that satisfies all du-paths coverage with respect to x. (Direct tours only.)
t1 = [1, 2, 6]
t2 = [1, 2, 3, 4, 5, 2, 3, 5, 2, 6]
t3 = [1, 2, 3, 5, 2, 3, 4, 5, 2, 6]

These three test paths together satisfy du-paths coverage with respect to x.