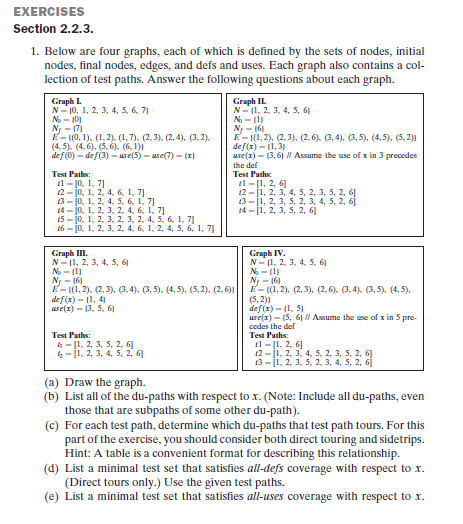
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Problem 1 (Graph II and Graph III)



C:\Users\Natnael Kebede\Desktop\Capture3.PNG

II a)

G = <N, N0, Nf, E>

Nodes (N): {1, 2, 3, 4, 5, 6}

Node 1: Initial node (N0)

Node 6: Final node (Nf)

Edges (E): {(1, 2), (2, 3), (2, 6), (3, 4), (3, 5), (5, 2)}

def (x) = {1, 3}

use (x) = {3, 6}

def ={x}

use = {} def ={}

use = {} use ={x} def ={} use = {}

def = {x}

4

3

1

2

6

5

def = {} def ={} use = {}

use = {x}

b) All the du-paths with respect to x are [1,2,3], [1,2,6], [3, 4, 5, 2, 6] and [3,5,2,6]

c) 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]

|  |
| --- |
| **Direct** |
| [1,2,6] by t1 |
| [1,2,3] by t2, t3 and t4 |
| [3, 4, 5, 2, 6] by t3 |
| [3,5,2,6] by t4 |

|  |
| --- |
| **Sidetrip** |
| [1,2,6] and [3, 4, 5, 2, 6] by t2 |
| [1,2,6] and [3,5,2,6] by t3 |
| [1,2,6] by t4 |

The test path t1 tours the du paths [1, 2, 6] directly because the du- path is the sub path of the

test path t1. In the same manner, the test path t2 tours the du-paths [1, 2, 3], the test path t3

tours [1,2,3] and [3, 4, 5, 2, 6] and the test path t4 tours [3, 5, 2, 6] since they are sub paths of

the respective test paths.

Test path t2 tours the du-paths [1, 2, 6] and [3, 4, 5, 2, 6], t3 tours [1,2,6] and [3,5,2,6]

and t4 tours [1,2,6] with sidetrips because every edge in the du-path is not in the test paths in

the same order.

d) The minimal test set that satisfies all –Defs coverage with respect to x would bet2 = [1*,* 2*,* 3*,*

4*,* 5*,* 2*,* 3*,* 5*,* 2*,* 6] and t3 = [1*,* 2*,* 3*,* 5*,* 2*,* 3*,* 4*,* 5*,* 2*,* 6]. They both tour at least one path to at

least one use.

e) The minimal test set that satisfies all-Uses coverage with respect to x would be

{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]} the test paths directly tour the du-paths. They tour at least one path for

every def-use pair and all the 4 du-paths are toured.

f) The minimal test set that satisfies all-DU-Paths coverage would be {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]}

This is because there is just one du-path for every du-pair. The test set tours every du- path.

III a)

G = <N, N0, Nf, E>

Nodes (N): {1, 2, 3, 4, 5, 6}

Node 1: Initial node (N0)

Node 6: Final node (Nf)

Edges (E): {(1, 2), (2, 3), (3, 4), (4, 5), (5, 2), (2, 6)}

def (x) = {1, 4}

use (x) = {3, 5, 6}

def ={x}

use = {} def ={}

use = {} def ={} def ={x} use = {}

use = {x}

4

3

1

2

6

5

def = {}

def ={} use = {x}

use = {x}

b) All the du-paths with respect to x are [1,2,3], [1,2,3,5], [1,2,6], [4,5], [4,5,2,3]

and [4,5,2,6]

c) *t*1 = [1*,* 2*,* 3*,* 5*,* 2*,* 6]

*t*2 = [1*,* 2*,* 3*,* 4*,* 5*,* 2*,* 6]

|  |
| --- |
| **Direct** |
| [1,2,3], [1,2,3,5] by t1 |
| [1,2,3], [4,5] and [4,5,2,6] by t2 |

|  |
| --- |
| Sidetrip |
| [1,2,6] by t1and t2 |

The test path t1 tours the du paths [1, 2, 3] and [1, 2, 3, 5] directly because the du- paths are a

sub path of the test path t1. In the same manner, the test path t2 tours the du-paths [1, 2, 3],

[4, 5] and [4, 5, 2, 6] since they are sub paths of the test path t2.

The test paths t1 and t2 tour the du-path [1, 2, 6] with sidetrips because every edge

in the du-path is also in the test paths in the same order.

d) The minimal test set that satisfies all –Defs coverage with respect to x would be *t*2 = [1*,* 2*,* 3*,*

4*,* 5*,* 2*,* 6]. It tours at least one path to at least one use.

e) The minimal test set that satisfies all-Uses coverage with respect to x would be

{ *t*1 = [1*,* 2*,* 3*,* 5*,* 2*,* 6], *t*2 = [1*,* 2*,* 3*,* 4*,* 5*,* 2*,* 6], [1, 2, 6], [1, 2, 3, 4, 5, 2, 3, 5, 2,

6] }

we added new tests in order to have a path to directly tour [1,2,6] and [4, 5, 2, 3]

these tour at least one path for every def-use pair and all the 6 du-paths are

toured.

f) The minimal test set that satisfies all-DU-Paths coverage would be {*t*1 = [1*,* 2*,*

3*,* 5*,* 2*,* 6] , *t*2 = [1*,* 2*,* 3*,* 4*,* 5*,* 2*,* 6], [1, 2, 6], [1, 2, 3, 4, 5, 2, 3, 5, 2, 6] }. This is

because there is just one du-path for every du-pair. The test set tours every du-

path.