SE 317, Quiz 2

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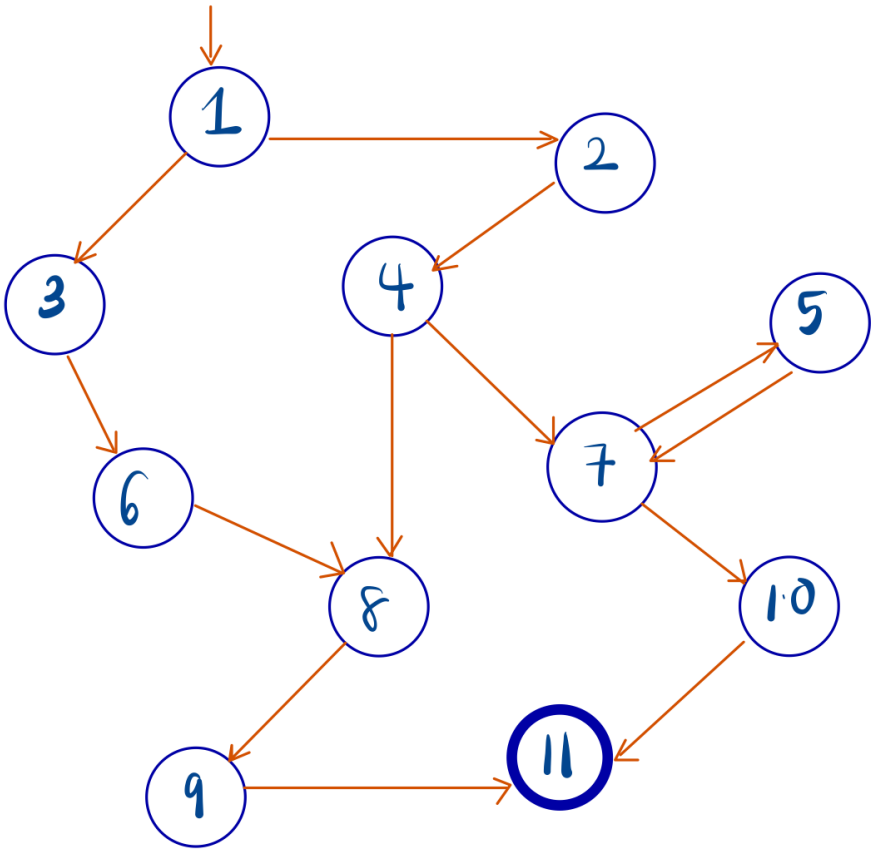
Question 1 (3 points):

a) Provide a graph similar to the graph shown in Fig.1 with (at least) 9 nodes and 12 edges including (at least) one loop. Your graph must be different from the one given. Don't use the given graph as part of your graph.



A graph with 11 nodes, 13 edges and 1 loop.

b) On your graph, write down the following coverage TR set and all the corresponding Test Paths

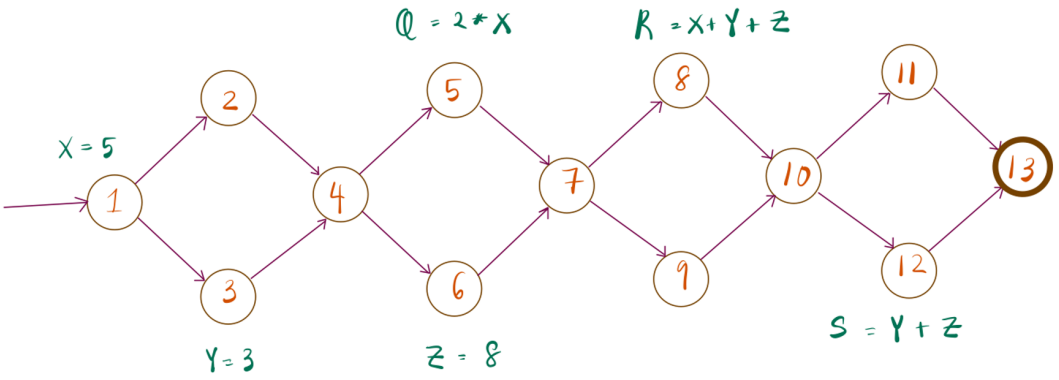
- Node Coverage
  - TR = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}
  - Test Paths = [1, 3, 6, 8, 9, 11], [1, 2, 4, 7, 5, 7, 10, 11]
- Edge Coverage
  - TR= { (1, 2), (1, 3), (2, 4), (3, 6), (6, 8), (4, 8), (4, 7), (8, 9), (7, 5), (5, 7), (7, 10), (9, 11), (10, 11) }
  - Test Paths = [1, 3, 6, 8, 9, 11], [1, 2, 4, 8, 9, 11], [1, 2, 4, 7, 5, 7, 10, 11]
- EPC
  - TR = { [1, 3, 6], [1, 2, 4], [2, 4, 8], [2, 4, 7], [3, 6, 8], [6, 8, 9], [4, 8, 9], [4, 7, 5], [5, 7, 5], [7, 5, 7], [4, 7, 10], [5, 7, 10], [8, 9, 11], [7, 10, 11] }
  - Test Paths = [1, 3, 6, 8, 9, 11], [1, 2, 4, 8, 9, 11], [1, 2, 4, 7, 10, 11], [1, 2, 4, 7, 5, 7, 5, 7, 10, 11]
- CPC
  - Test Path = [1, 3, 6, 8, 9, 11], [1, 2, 4, 8, 9, 11], [1, 2, 4, 7, 10, 11], [1, 2, 4, 7, 5, 7, 10, 11], [1, 2, 4, 7, 5, 7, 5, 7, 10, 11], ...

Question 2 (3 points):

a) Provide a graph similar to the graph shown in Fig.2 with (at least) 10 nodes and 15 edges. Your graph must be different from the one given. Don't use the given graph as part of your graph

b) On your graph, show (at least) three variables (X, Y, Z) defined. Each variable must be used at least 2 times. At least one of your defined variables must use another defined variable after both have been initially defined in previous nodes. For example:

X = 3; (at some node i)
Y = 2; (Y must be defined at a different node j, where j != i)
Then
Y = X (X must be used at a different node k, where k != j)



A graph with 13 nodes and 16 edges

c) Write down the following

a. **All-defs for X, Y, Z**

- def(1) = {X}
- def(3) = {Y}
- def(6) = {Z}

b. **All-uses for X, Y, Z**

- use(5) = {X}
- use(8) = {X, Y, Z}
- use(12) = {Y, Z}

c. **All-du-paths for X, Y, Z**

DU Paths for X

- To node 5 (Q =2*X)
  - [1, 2, 4, 5], [1, 3, 4, 5]
- To node 8 (R = X+Y+Z)

- [1, 2, 4, 5, 7, 8], [1, 2, 4, 6, 7, 8], [1, 3, 4, 5, 7, 8], [1, 3, 4, 6, 7, 8]

DU Paths for Y

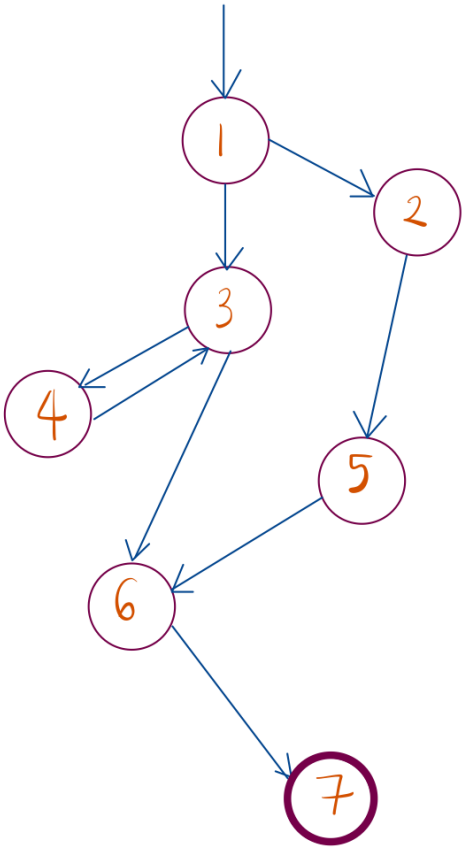
- To node 8 (R = X+Y+Z)
  - [1, 3, 4, 5, 7, 8], [1, 3, 4, 6, 7, 8]
- To node 12 (S = Y+Z)
  - [1, 3, 4, 5, 7, 8, 10, 12], [1, 3, 4, 5, 7, 9, 10, 12],[1, 3, 4, 6, 7, 8, 10, 12], [1, 3, 4, 6, 7, 9, 10, 12]

DU Paths for Z

- To node 8 (R = X+Y+Z)
  - [1, 2, 4, 6, 7, 8], [1, 3, 4, 6, 7, 8]
- To node 12 (S = Y+Z)
  - [1, 2, 4, 6, 7, 8, 10, 12], [1, 2, 4, 6, 7, 9, 10, 12], [1, 3, 4, 6, 7, 8, 10, 12], [1, 3, 4, 6, 7, 9, 10, 12]

Question 3 (3%):

Provide a graph with (at least) 6 nodes and 8 edges including (at least) one loop. Your graph must be different from the ones in the textbook.



A graph with 7 nodes, 8 edges and one loop.

a) Write down all the simple paths of length up to 4.

- Length 0
  - [1]
  - [2]
  - [3]
  - [4]
  - [5]
  - [6]
  - [7]!
- Length 1
  - [1, 2]

    - [1, 3]
    - [3, 4]
    - [4, 3]
    - [2, 5]
    - [3, 6]
    - [5, 6]
    - [6, 7]!
- Length 2
    - [1, 2, 5]
    - [2, 5, 6]
    - [5, 6, 7]!
    - [1, 3, 4]
    - [1, 3, 6]
    - [4, 3, 6]
    - [3, 4, 3]*
    - [4, 3, 4]*
    - [3, 6, 7]!
- Length 3
    - [1, 2, 5, 6]
    - [2, 5, 6, 7]!
    - [1, 3, 6, 7]!
- Length 4
    - [1, 2, 5, 6, 7]!

b) Write down the prime paths

- [1, 2, 5, 6, 7]!
- [1, 3, 6, 7]!

Question 4 (3 points)

For the data flow graph given in Fig.3, identify the following and **identify any issues you find in the graph testing.**

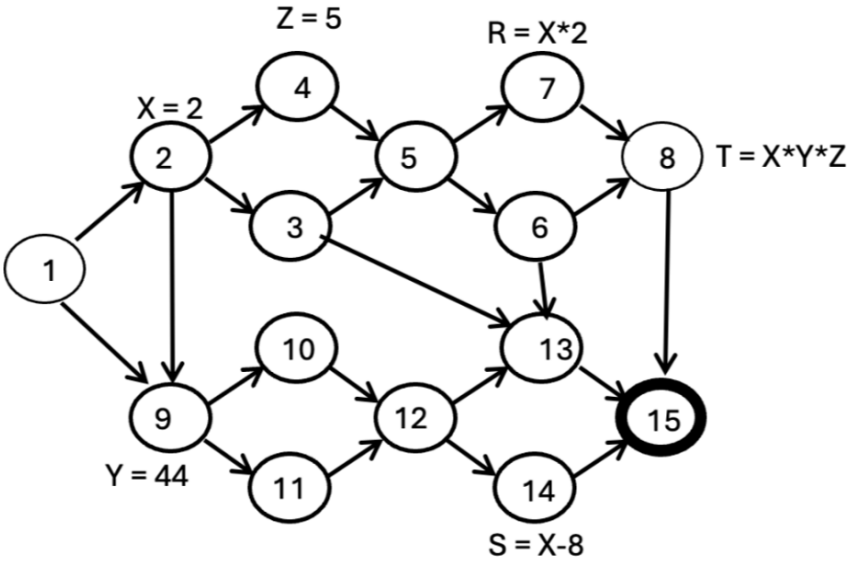


Figure 3

a. **All defs for X, Y, and Z**

- def(2) = {X}
- def(9) = {Y}
- def(4) ={Z}

b. **All uses for X, Y, and Z**

- use(14) = {X}
- use(7) = {X}
- use(8) = {X, Y, Z}

c. **All du paths for X, Y, Z**

DU Paths for X

- To node 7 (R = X *2)
  - [1, 2, 4, 5, 7], [1, 2, 3, 5, 7]

- To node 8 (T = X*Y*Z)
  - [1, 2, 4, 5, 7, 8], [1, 2, 4, 5, 6, 8], [1, 2, 3, 5, 6, 8], [1, 2, 3, 5, 7, 8]
- To node 14 (S = X-8)
  - [1, 2, 9, 10, 12, 14], [1, 2, 9, 11, 12, 14]

DU Paths for Y

- To node 8 (T = X*Y*Z)
  - none valid du-paths

DU Paths for Z

- To node 8 (T = X*Y*Z)
  - [1, 2, 4, 5, 7, 8] [1, 2, 4, 5, 6, 8]

d. Any issues:

- The calculation for `T = X*Y*Z` would always face an undefined Y variable issue as variable Y is not reachable.

Question 5 (3 points)

For the graph in Fig. 4 below, identify the TR set and the test paths of the following:

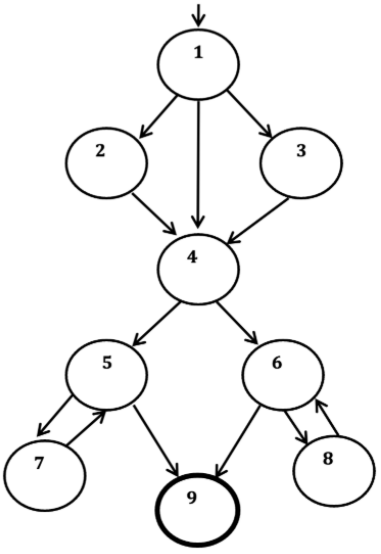


Figure 4

- Node Coverage
  - TR = {1, 2, 3, 4, 5, 6, 7, 8, 9}
  - Test paths = [1, 2, 4, 5, 7, 5, 9], [1, 3, 4, 6, 8, 6, 9]
- Edge Coverage
  - TR = { (1, 2), (1, 3), (1, 4), (2, 4), (3, 4), (4, 5), (4, 6), (5, 7), (7, 5), (6, 8), (8, 6), (5, 9), (6, 9)}
  - Test paths = [1, 2, 4, 5, 7, 5, 9], [1, 3, 4, 6, 8, 6, 9], [1, 4, 5, 9]
- Edge-Pair Coverage
  - TR = { (1, 2, 4), (1, 3, 4), (2, 4, 5), (2, 4, 6), (3, 4, 5), (3, 4, 6), (1, 4, 5), (1, 4, 6), (4, 5, 7), (4, 5, 9), (4, 6, 8), (4, 6, 9), (5, 7, 5), (7, 5, 7), (6, 8, 6), (8, 6, 8), (7, 5, 9), (8, 6, 9)}
  - Test paths= [1, 2, 4, 5, 7, 5, 7, 5, 9], [1, 3, 4, 6, 8, 6, 8, 6, 9], [1, 3, 4, 5, 9], [1, 2, 4, 6, 9], [1, 4, 6, 9], [1, 4, 5, 9]
- Complete Path Coverage
  - Test Paths = [1, 2, 4, 5, 9], [1, 3, 4, 6, 9], [1, 4, 5, 7, 5, 9], [1, 4, 6, 8, 6, 9], [1, 4, 5, 7, 5, 7, 5, 9], [1, 4, 6, 8, 6, 8, 6, 9], ...