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Problem 1

Explore order:

1 4 2 3 10 6 8 7 5 9

Value (pre, post):

vertex 1 :(1,20)

vertex 2 :(3,18)

vertex 3 :(4,17)

vertex 4 :(2,19)

vertex 5 :(9,12)

vertex 6 :(6,15)

vertex 7 :(8,13)

vertex 8 :(7,14)

vertex 9 :(10,11)

vertex 10 :(5,16)

edge classification:

tree :

[(1, 4), (2, 3), (3, 10), (4, 2), (5, 9), (6, 8), (7, 5), (8, 7), (10, 6)]

forward:

[(1, 5), (1, 6), (2, 7), (2, 9), (4, 6), (6, 9), (8, 9), (10, 8)]

back :

[(2, 4), (3, 2), (4, 1), (5, 1), (5, 7), (6, 1), (6, 4), (6, 10), (7, 2), (7, 8), (8, 6), (8, 10), (9, 2), (9, 5), (9, 6), (9, 8), (10, 3)]

cross

[]

Step by Step and Call Depth

now exploring 1

depth 1

visited[1] sets True

pre[1] sets 1

clock increase from 1 to 2

now exploring 4

depth 2

visited[4] sets True

pre[4] sets 2

clock increase from 2 to 3

4 is already explored

now exploring 2

depth 3

visited[2] sets True

pre[2] sets 3

clock increase from 3 to 4

now exploring 3

depth 4

visited[3] sets True

pre[3] sets 4

clock increase from 4 to 5

3 is already explored

now exploring 10

depth 5

visited[10] sets True

pre[10] sets 5

clock increase from 5 to 6

10 is already explored

now exploring 6

depth 6

visited[6] sets True

pre[6] sets 6

clock increase from 6 to 7

6 is already explored

6 is already explored

now exploring 8

depth 7

visited[8] sets True
pre[8] sets 7
clock increase from 7 to 8
8 is already explored
now exploring 7
depth 8
visited[7] sets True
pre[7] sets 8
clock increase from 8 to 9
7 is already explored
now exploring 5
depth 9
visited[5] sets True
pre[5] sets 9
clock increase from 9 to 10
5 is already explored
5 is already explored
now exploring 9
depth 10
visited[9] sets True
pre[9] sets 10
clock increase from 10 to 11
9 is already explored
9 is already explored
9 is already explored
9 is already explored
post[9] sets 11
clock increase from 11 to 12
post[5] sets 12
clock increase from 12 to 13
7 is already explored
post[7] sets 13
clock increase from 13 to 14

8 is already explored

8 is already explored

post[8] sets 14

clock increase from 14 to 15

6 is already explored

6 is already explored

post[6] sets 15

clock increase from 15 to 16

10 is already explored

post[10] sets 16

clock increase from 16 to 17

post[3] sets 17

clock increase from 17 to 18

2 is already explored

2 is already explored

2 is already explored

post[2] sets 18

clock increase from 18 to 19

4 is already explored

post[4] sets 19

clock increase from 19 to 20

1 is already explored

1 is already explored

post[1] sets 20

Problem 2

Explore order:

1 3 4 10 8 2 5 6 7 9

Topologically sort:

9 7 6 5 2 1 10 8 3 4 (the reverse sort of post number)

Value (pre, post):

vertex 1 :(1,10)

vertex 2 :(11,12)

vertex 3 :(2,5)

vertex 4 :(3,4)

vertex 5 :(13,14)

vertex 6 :(15,16)

vertex 7 :(17,18)

vertex 8 :(7,8)

vertex 9 :(19,20)

vertex 10 :(6,9)

edge classification:

tree :

[(1, 3), (1, 10), (3, 4), (10, 8)]

forward:

[(1,4)]

back:

[]

cross:

[(2, 8), (5, 2), (5, 10), (6, 10), (7, 3), (7, 4), (7, 10), (8, 3), (9, 2), (9, 3), (9, 4), (9, 5), (9, 8), (10, 3), (10, 4)]

Determine it is acyclic:

According to text book, there are no back edges in this graph, so it is acyclic.

Step by Step and Call Depth

now exploring 1

depth 1

visited[1] sets True

pre[1] sets 1

clock increase from 1 to 2

now exploring 3

depth 2

visited[3] sets True

pre[3] sets 2
clock increase from 2 to 3
now exploring 4
depth 3
visited[4] sets True
pre[4] sets 3
clock increase from 3 to 4
post[4] sets 4
clock increase from 4 to 5
post[3] sets 5
clock increase from 5 to 6
1 is already explored
now exploring 10
depth 2
visited[10] sets True
pre[10] sets 6
clock increase from 6 to 7
10 is already explored
10 is already explored
now exploring 8
depth 3
visited[8] sets True
pre[8] sets 7
clock increase from 7 to 8
8 is already explored
post[8] sets 8
clock increase from 8 to 9
post[10] sets 9
clock increase from 9 to 10
post[1] sets 10
clock increase from 10 to 11
now exploring 2
depth 1

visited[2] sets True
pre[2] sets 11
clock increase from 11 to 12
2 is already explored
post[2] sets 12
clock increase from 12 to 13
now exploring 5
depth 1
visited[5] sets True
pre[5] sets 13
clock increase from 13 to 14
5 is already explored
5 is already explored
post[5] sets 14
clock increase from 14 to 15
now exploring 6
depth 1
visited[6] sets True
pre[6] sets 15
clock increase from 15 to 16
6 is already explored
post[6] sets 16
clock increase from 16 to 17
now exploring 7
depth 1
visited[7] sets True
pre[7] sets 17
clock increase from 17 to 18
7 is already explored
7 is already explored
7 is already explored
post[7] sets 18
clock increase from 18 to 19

now exploring 9

depth 1

visited[9] sets True

pre[9] sets 19

clock increase from 19 to 20

9 is already explored

9 is already explored

9 is already explored

9 is already explored

9 is already explored

post[9] sets 20