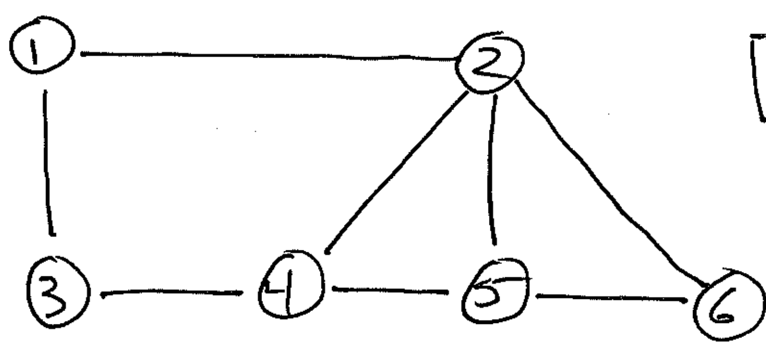
CSE 101-01 4-18-23

Paz: ext. 2 more days.

Ex.



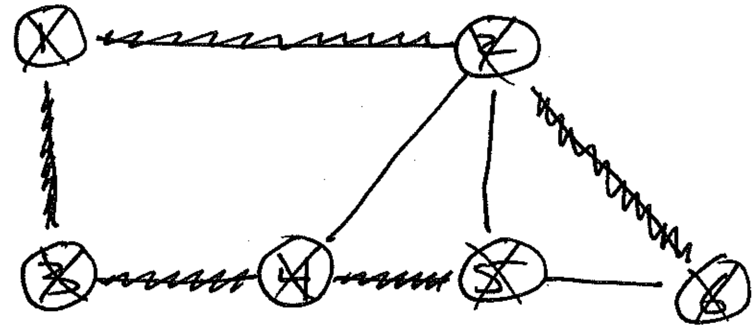
$\boxed{s=3}$

	adj	color	d	p
1	2 3	~~w~~ ~~g~~ b	~~∞~~ 1	~~nil~~ 3
2	1 4 5 6	~~w~~ ~~g~~ b	~~∞~~ 2	~~nil~~ 1
3	1 4	~~w~~ ~~g~~ b	0	nil
4	2 3 5	~~w~~ ~~g~~ b	~~∞~~ 1	~~nil~~ 3
5	2 4 6	~~w~~ ~~g~~ b	~~∞~~ 2	~~nil~~ 4
6	2 5	~~w~~ ~~g~~ b	~~∞~~ 3	~~nil~~ 2

Q: ~~3~~ ~~1~~ ~~4~~ ~~2~~ ~~5~~ ~~6~~

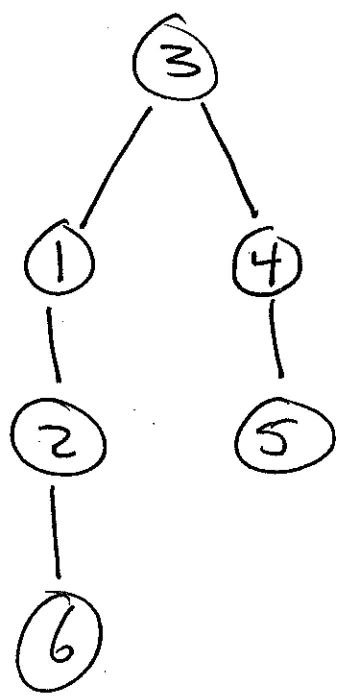
Short way

$\boxed{s=3}$



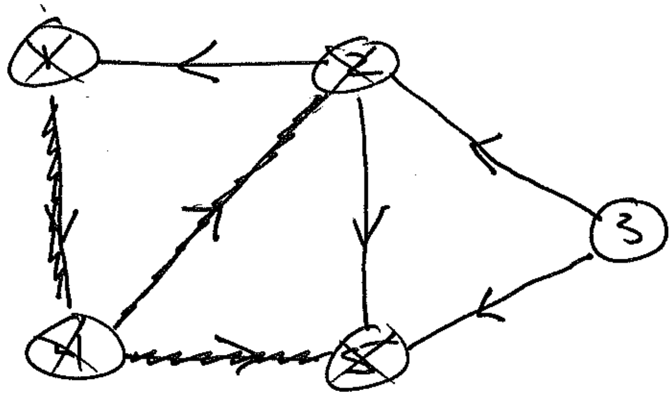
Q: $\cancel{3}\ \cancel{1}\ \cancel{4}\ \cancel{2}\ \cancel{5}\ \cancel{6}$

BFS Tree:



dist.
0
1
2
3

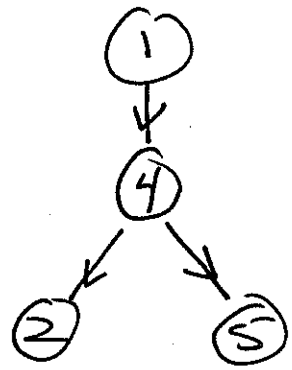
Ex.



$\boxed{s = 1}$

Q: ~~1~~ ~~4~~ ~~2~~ ~~5~~

Tree!



d
0
1
2

	adj	color	d	p
1	4	b	0	n
2	1 5	b	2	4
3	2 5	w	∞	n
4	2 5	b	1	1
5		b	2	4

Predecessor subgraph

$$T = (V_p, E_p)$$

$$V_p = \{ x \in V(G) \mid p[x] \neq nil \} \cup \{s\}$$

$$E_p = \{ (p[x], x) \mid p[x] \neq nil \}$$

digraph $\leftrightarrow$ ordered pair
graph $\longleftrightarrow$ unordered pair

Pseudo-code: PrintPath(G, s, x)

Depth First Search (DFS)

Vertex attributes:

- color[x]: w, g, b
- p[x] : parent of x
- d[x] : discover time of x
- f[x] : finish " " "

Subroutine: Visit(x), recursive.

time: $0 \le \text{time} \le 2n$

$n = |V(G)|$

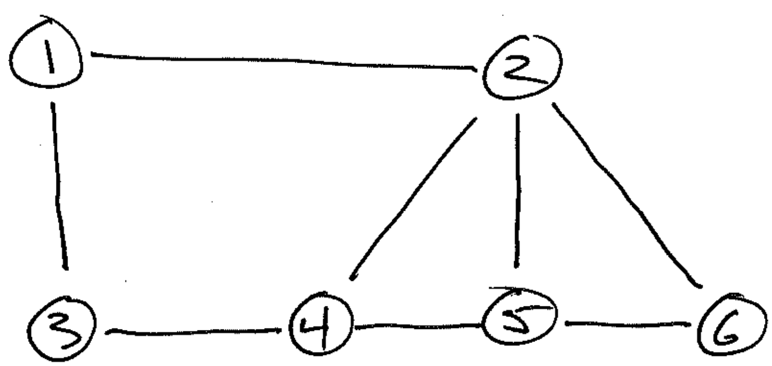
Predecessor subgraph:

$$(V_p, E_p)$$

$$V_p = V(G)$$

$$E_p = \{ (p[x], x) \mid p[x] \neq nil \}$$

Ex.



	adj	color	d	f	p
1	2 3	~~w~~ ~~g~~ b	1	12	n
2	1 4 5 6	~~w~~ ~~g~~ b	2	11	~~n~~ 1
3	1 4	~~w~~ ~~g~~ b	4	5	~~n~~ 4
4	2 3 5	~~w~~ ~~g~~ b	3	10	~~n~~ 2
5	2 4 6	~~w~~ ~~g~~ b	6	9	~~n~~ 4
6	2 5	~~w~~ ~~g~~ b	7	8	~~n~~ 5

time

~~0~~
~~1~~
~~2~~
~~3~~ ~~10~~
~~4~~ ~~11~~
~~5~~ 12
~~6~~
~~7~~
~~8~~
~~9~~

DFS Forest: