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Homework 4: (#1 and #2)

Exercise 1

1) BFS(G,s)
for each voter $u \in G.V - \{s\}$
    u.color = WHITE
    u.d = ∞
    u.π = NULL
s.color = GRAY
s.d = 0
s.π = NULL
Q = ∅
ENQUEUE(Q,s)
while(Q ≠ ∅)
    u = DEQUEUE(Q)
      for each $v \in G.Adj[u]$
        if v.color == WHITE
          v.color = GRAY
          v.d = u.d + 1
          v.π = u
          ENQUEUE(Q,v)
    u.color = BLACK
for each vertex $v \neq \in G.V$
    if (v.color == WHITE) {
        BFS(G,v)
   } else {
    continue;
  }

2) We have to change DFS so that it places the vertices into an array in reverse order. Once all of its descendents have been processed. Then we mark all of the vertices that haven't been processed yet & traverse those unvisited vertices
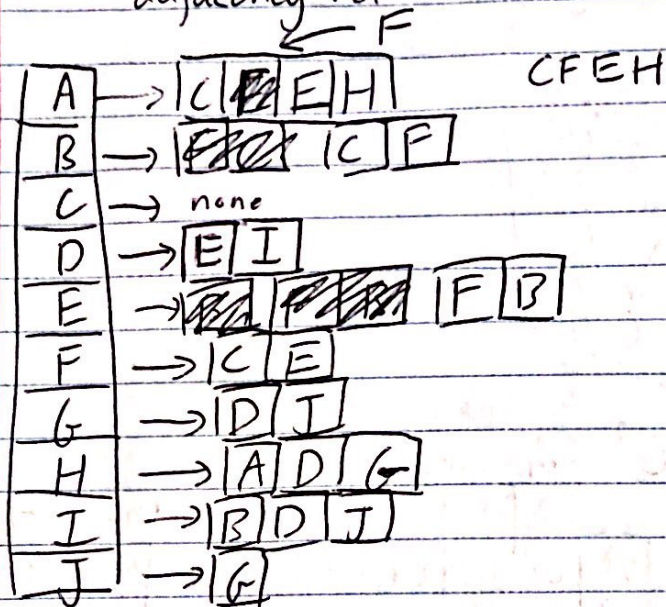
3) ~~examples~~

$$O(|V| + |E|)$$ where V = vertices
E = edge

~~linear~~ Linear time

Exercise2.)

part 1:

adjacency list

A → | C | ~~F~~ | E | H | CFEH

B → | ~~A~~ | ~~A~~ | C | F |

C → none

D → | E | I |

E → | ~~A~~ | ~~A~~ | ~~A~~ | F | B |

F → | C | E |

G → | D | J |

H → | A | D | G |

I → | B | D | J |

J → | G |

part 2:

	A	B	C	D	E	F	G	H	I	J
A	0	0	1	0	1	1	0	1	0	0
B	0	0	1	0	0	1	0	0	0	0
C	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	1	0	0	0	1	0
E	0	1	0	0	0	1	0	0	0	0
F	0	0	1	0	1	0	0	0	0	0
G	0	0	0	1	0	0	0	0	0	1
H	1	0	0	1	0	0	1	0	0	0
I	0	1	0	1	0	0	0	0	0	1
J	0	0	0	0	0	0	1	0	0	0

part 3:

G^T Graph
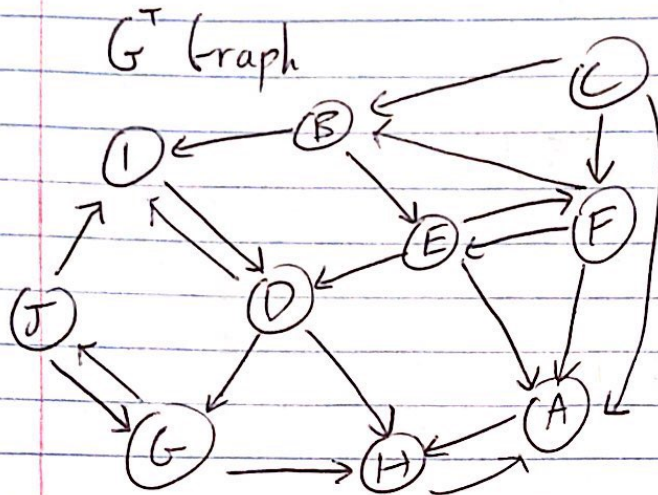
G^T Adjacency list:

A →	H
B →	E I
C →	A B F
D →	H G I
E →	F A D
F →	A B E
G →	H J
H →	A
I →	D
J →	G I

G^T Adjacency Matrix:

	A	B	C	D	E	F	G	H	I	J
A	0	0	0	0	0	0	0	1	0	0
B	0	0	0	0	1	0	0	0	1	0
C	1	1	0	0	0	1	0	0	0	0
D	0	0	0	0	0	1	1	0	0	0
E	1	0	0	1	0	1	0	0	0	0
F	1	1	0	0	1	0	0	0	0	0
G	0	0	0	0	0	0	0	1	0	1
H	1	0	0	0	0	0	0	0	0	0
I	0	0	0	1	0	0	0	0	0	0
J	0	0	0	0	0	0	1	0	1	0

Exercise 2:
Part 4: Depth First Search

Tree Edge

Forwards Edge

Backwards Edge

Start

Cross Edge
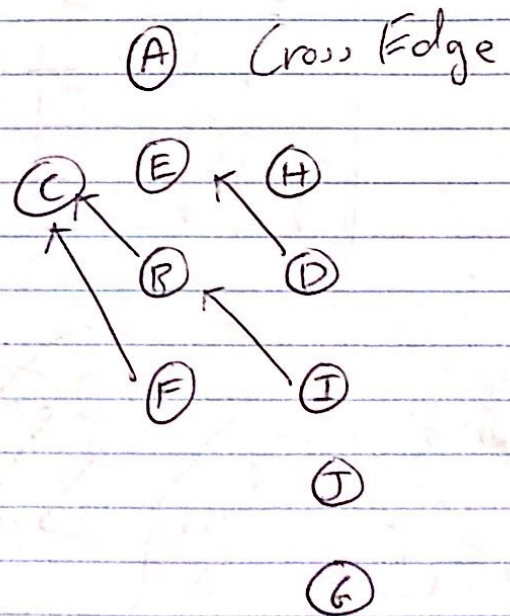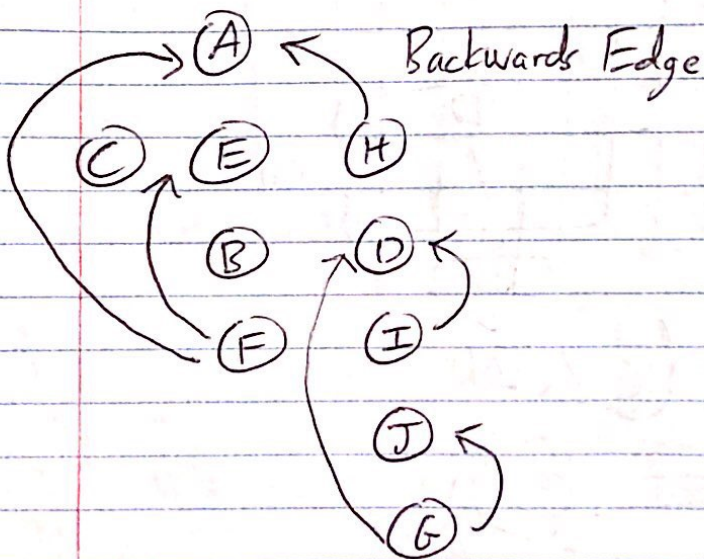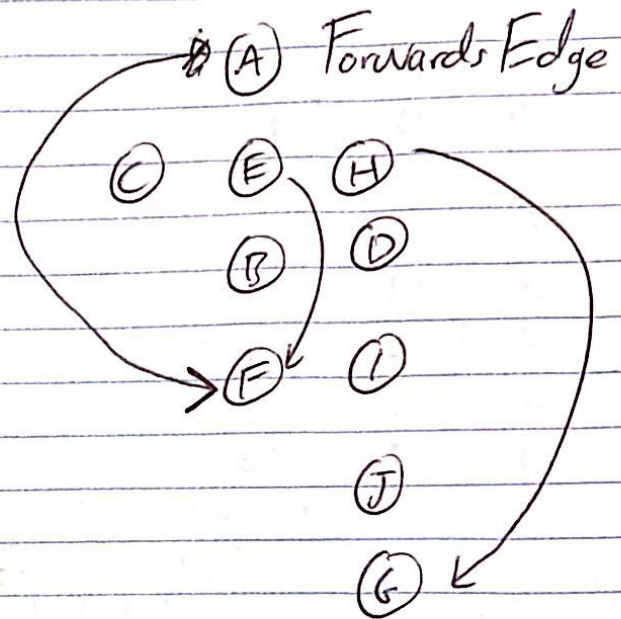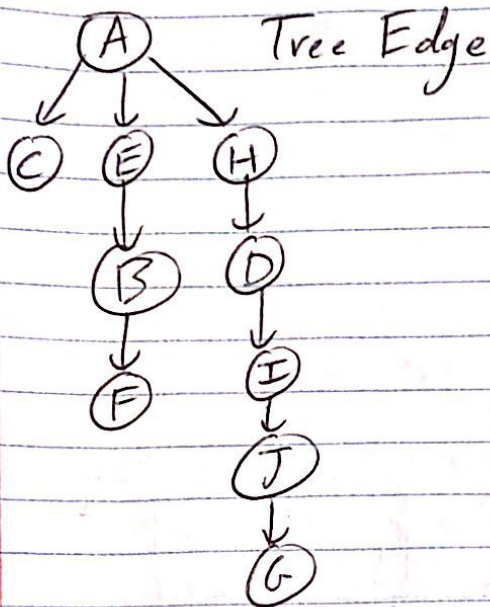
	Start	Finish
A	1	20
B	5	8
C	2	3
D	11	18
E	4	9
F	6	7
G	14	15
H	10	19
I	12	17
J	13	16

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

A

A

C

E → B → F

J → H → D → I → J → G

Part 6: