

COMS 590

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HW 2

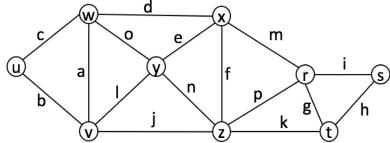
Yu-Pin  
Liang

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- 1) For the network shown, compute the following plots by hand. Show your work (10 points).



(a)

- a) Plot the connectivity distribution of  $k$  vs.  $P(k)$   
b) Plot the distribution of the clustering coefficient,  $k$  vs.  $C(k)$

$$D(v) = 4$$

$$D(s) = 2$$

$$D(t) = 3$$

$$D(u) = 2$$

$$D(v) = 3$$

$$D(w) = 4$$

$$D(x) = 4$$

$$D(y) = 4$$

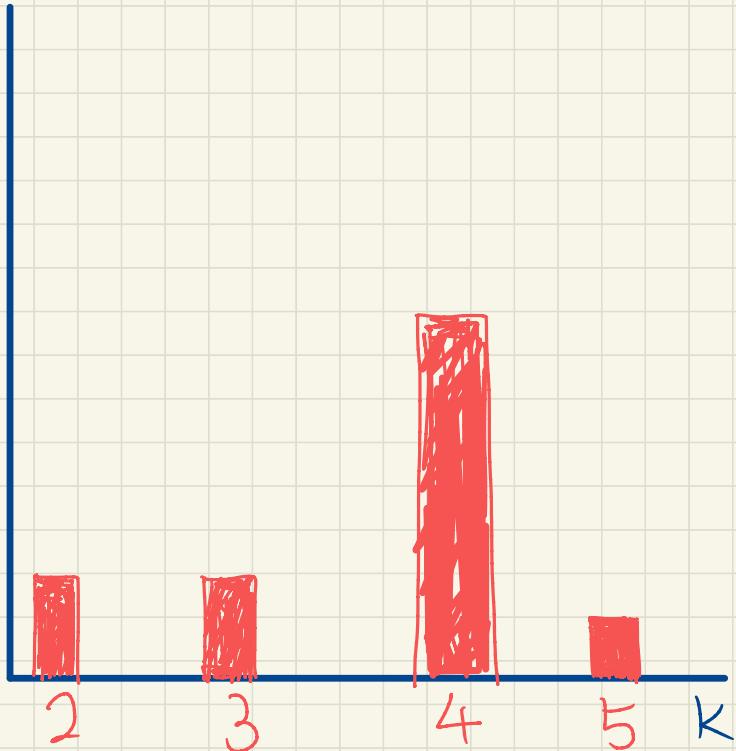
$$D(z) = 5$$

$$P(k)$$

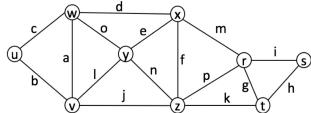
$$\frac{4}{9}$$

$$\frac{2}{9}$$

$$\frac{1}{9}$$



- Spring 2022  
1) For the network shown, compute the following plots by hand. Show your work (10 points).



(b)

- a) Plot the connectivity distribution of  $k$  vs.  $P(k)$   
b) Plot the distribution of the clustering coefficient,  $k$  vs.  $C(k)$

$$K(v) = 4 \quad h(r) = 3 \quad C(r) = \frac{2 \times 3}{4(4-1)} = \frac{1}{2}$$

$$K(s) = 2 \quad n(s) = 1 \quad C(s) = \frac{2 \times 1}{2(2-1)} = 1$$

$$K(t) = 3 \quad n(t) = 2 \quad C(t) = \frac{2 \times 2}{3(3-1)} = \frac{2}{3}$$

$$K(u) = 2 \quad h(u) = 1 \quad C(u) = \frac{2 \times 1}{2(2-1)} = 1$$

$$K(v) = 3 \quad n(v) = 3 \quad C(v) = \frac{2 \times 3}{3(3-1)} = 1$$

$$K(w) = 4 \quad n(w) = 3 \quad C(w) = \frac{2 \times 3}{4(4-1)} = \frac{1}{2}$$

$$K(x) = 4 \quad n(x) = 3 \quad C(x) = \frac{2 \times 3}{4x(4-1)} = \frac{1}{2}$$

$$K(y) = 4 \quad n(y) = 4 \quad C(y) = \frac{2 \times 4}{4x(4-1)} = \frac{2}{3}$$

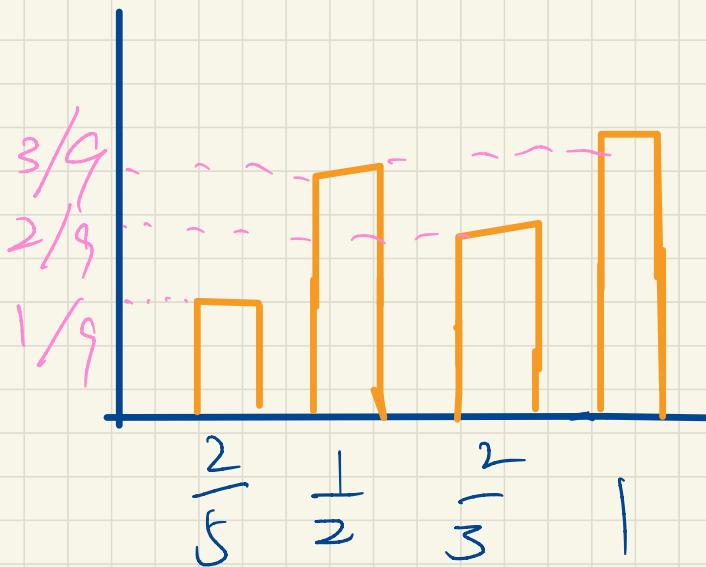
$$K(z) = 5 \quad n(z) = 4 \quad C(z) = \frac{2 \times 4}{5x(5-1)} = \frac{2}{5}$$

### COEFFICIENT

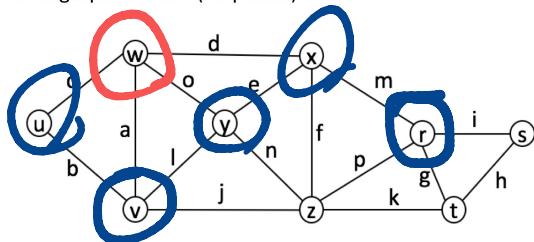
- If a vertex  $v$  has  $kv$  neighbors; then at most  $kv(kv-1)/2$  edges can exist between them
- $C_v$  is the fraction of these allowable edges that actually exist.

$$C_v = \frac{n_v}{\binom{k_v}{2}} = \frac{2n_v}{k_v(k_v-1)}$$

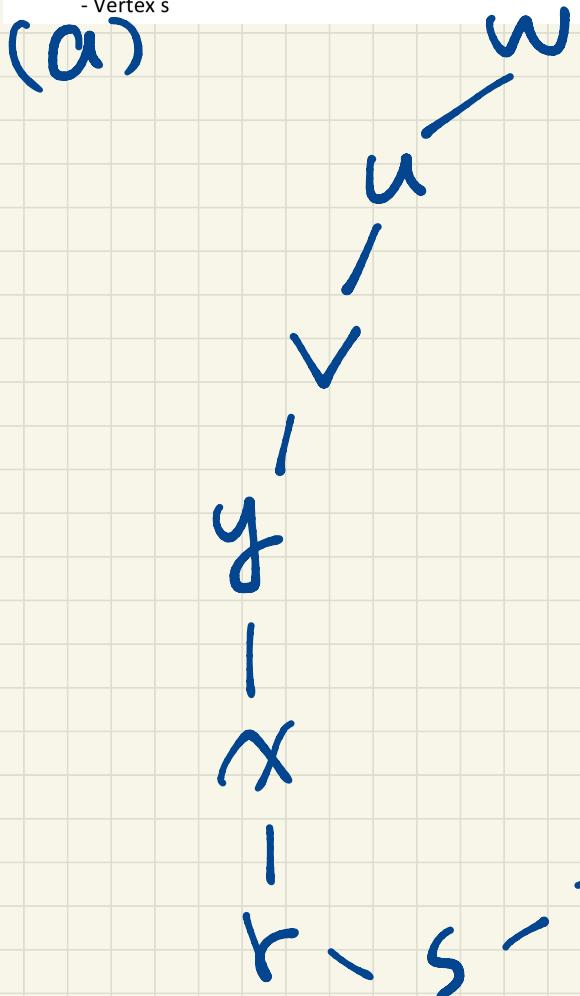
- $kv$ -degree of node  $V$
- $nV$  number of edges between node  $V$ 's neighbors or number of triangles through  $V$



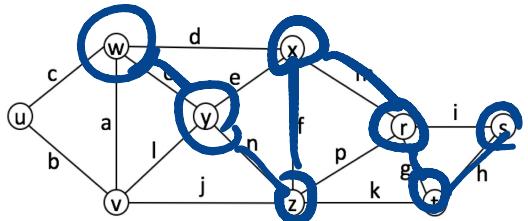
2) In the problem below, draw the depth first tree that results when the DFS algorithm is applied starting at the specified vertex. Include the df\_numbers (the order where nodes are searched). Use the a) lexicographic order as the default priority and b) the reverse lexicographic order. (10 points)



- Vertex w
- Vertex s

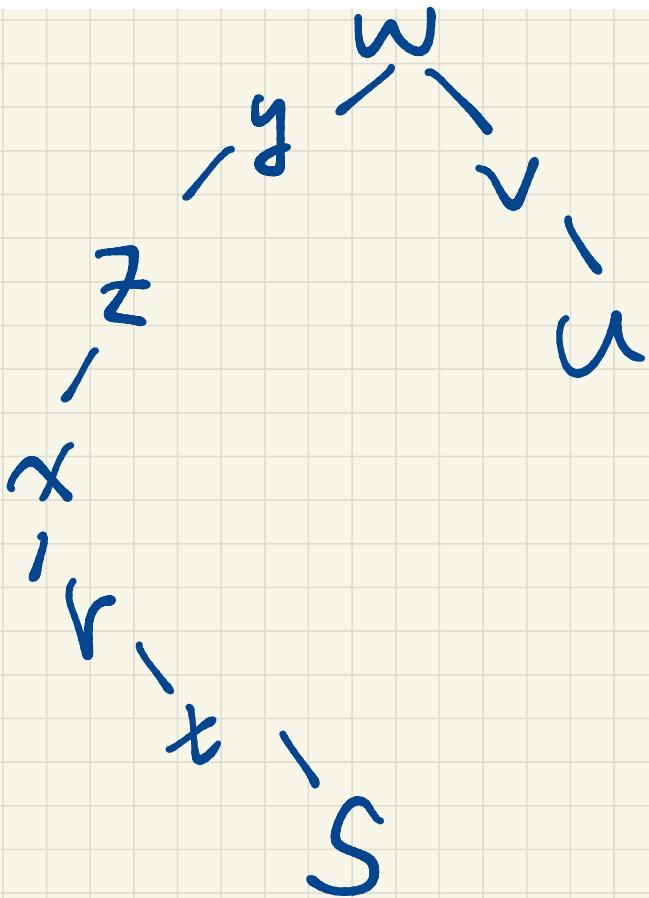


2) In the problem below, draw the depth first tree that results when the DFS algorithm is applied starting at the specified vertex. Include the df\_numbers (the order where nodes are searched). Use the a) lexicographic order as the default priority and b) the reverse lexicographic order. (10 points)

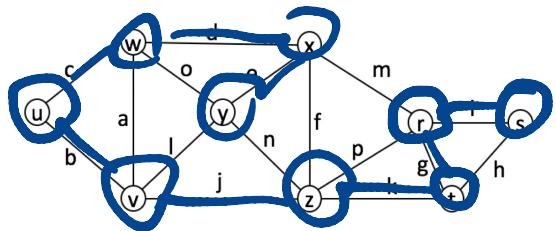


- Vertex w
- Vertex s

(b)

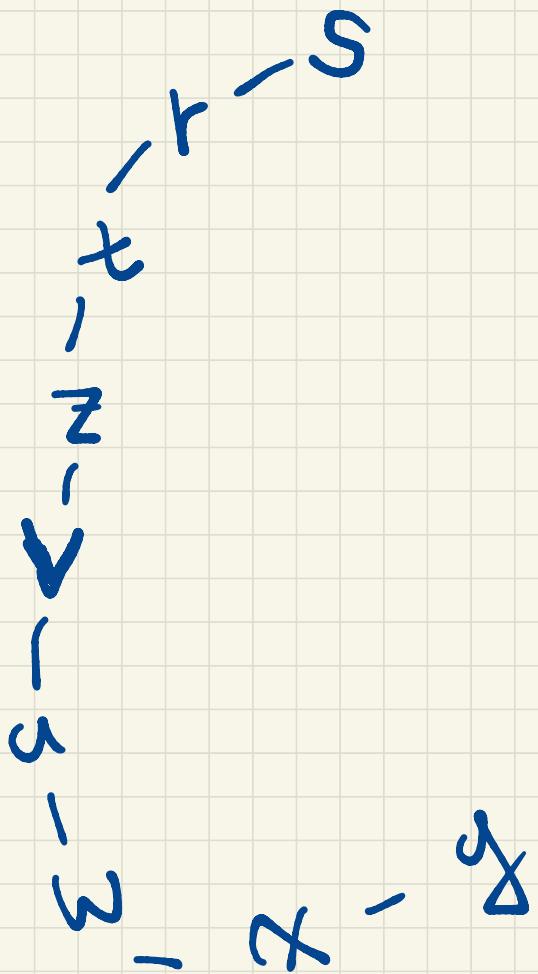


2) In the problem below, draw the depth first tree that results when the DFS algorithm is applied starting at the specified vertex. Include the df\_numbers (the order where nodes are searched. Use the a) lexicographic order as the default priority and b) the reverse lexicographic order. (10 points)

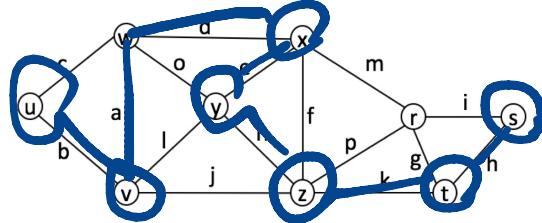


- Vertex w
- Vertex s

(a)

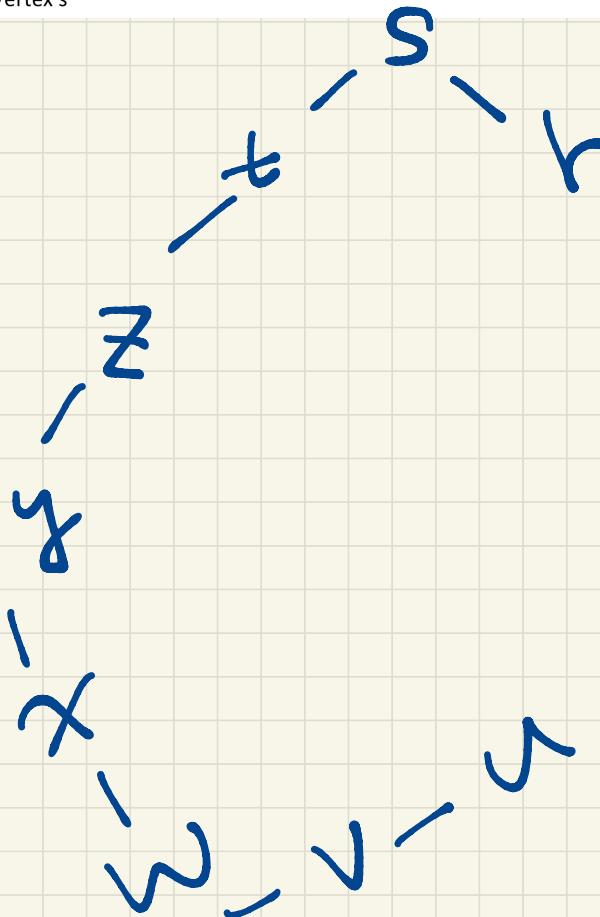


2) In the problem below, draw the depth first tree that results when the **DFS** algorithm is applied starting at the specified vertex. Include the df\_numbers (the order where nodes are searched. Use the a) lexicographic order as the default priority and b) the reverse lexicographic order. (10 points)

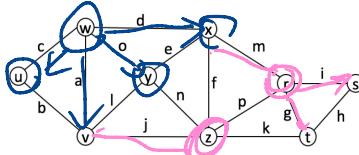


- Vertex w
  - Vertex s

(b)



- 3) In the problem below, draw the breadth first tree that results when the BFS algorithm is applied starting at the specified vertex. Include the bf\_numbers (the order where nodes are searched. Use the a) lexicographic order as the default priority and b) the reverse lexicographic order. (10 points)

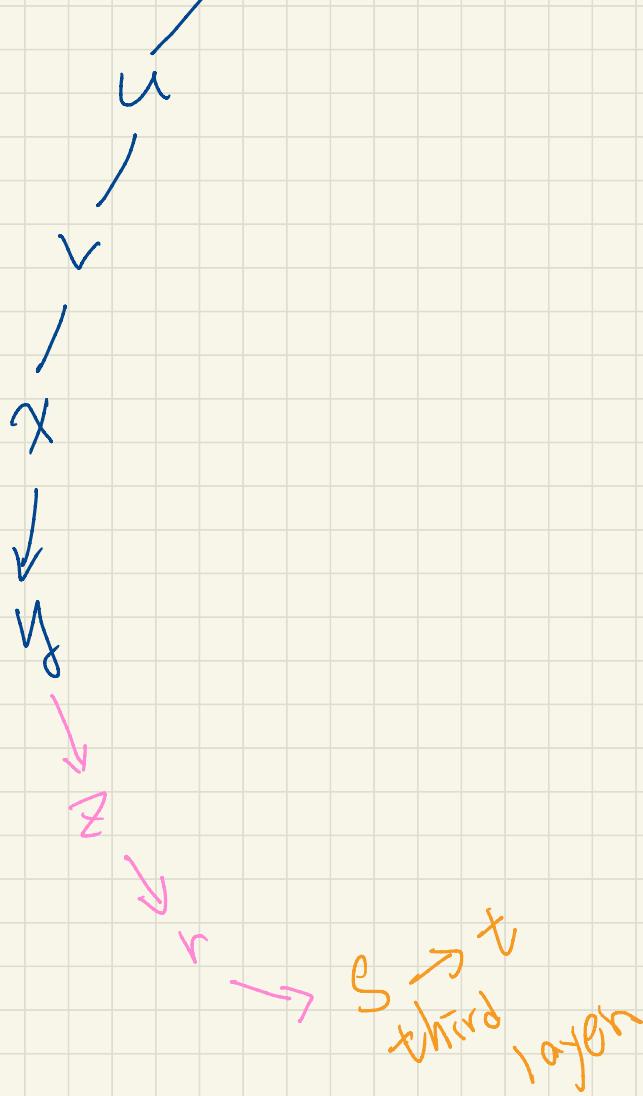


- Vertex w
- Vertex s

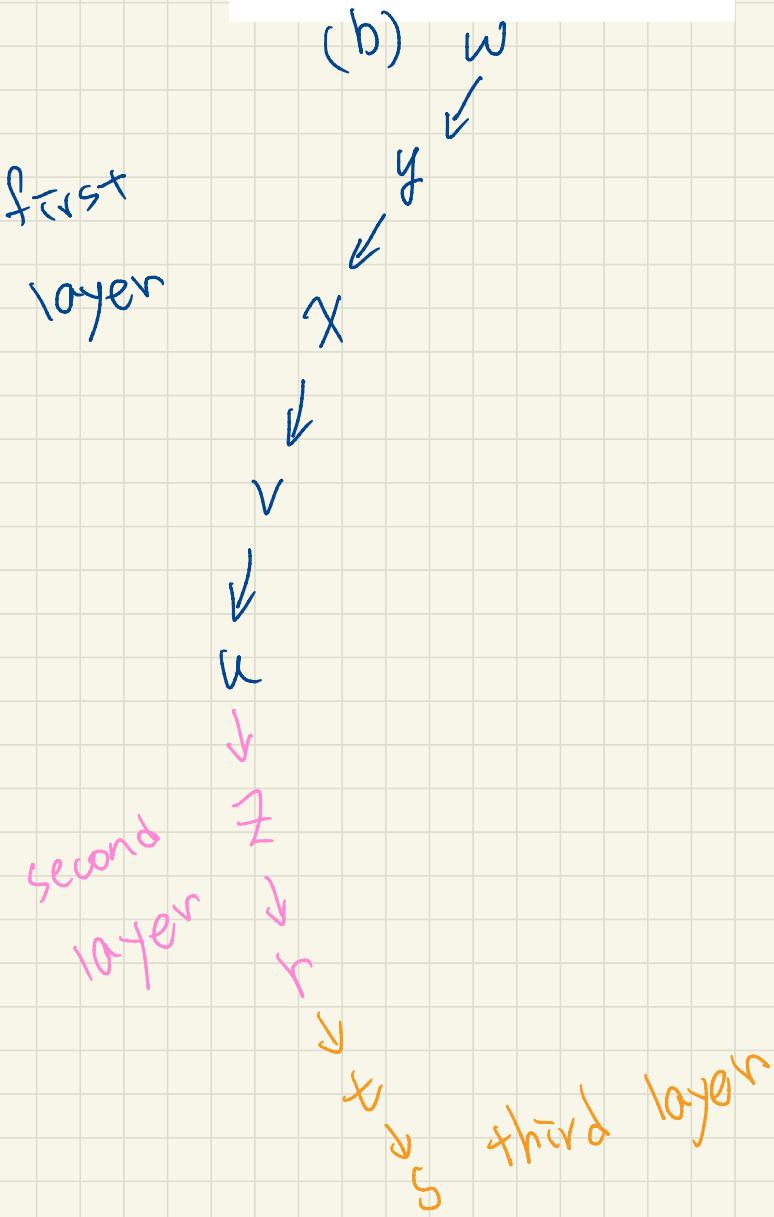
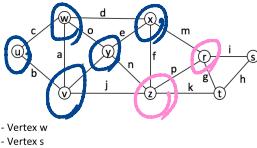
(a)

w

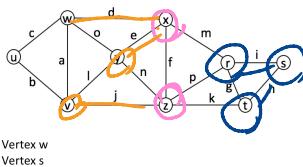
first  
layer



- 3) In the problem below, draw the breadth first tree that results when the BFS algorithm is applied starting at the specified vertex. Include the bf\_numbers (the order where nodes are searched). Use the a) lexicographic order as the default priority and b) the reverse lexicographic order. (10 points)



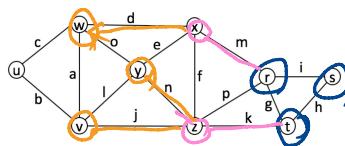
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(a)



- 3) In the problem below, draw the breadth first tree that results when the BFS algorithm is applied starting at the specified vertex. Include the bf\_numbers (the order where nodes are searched). Use the a) lexicographic order as the default priority and b) the reverse lexicographic order. (10 points)



- Vertex w
- Vertex s

(b)

S

first layer

七

5

1

7

x

10

1

1

1

1

5

## second layer

third layer

forth layer