CSCI-GA.1170-001 Final - Slot 2

Ankit Sati

TOTAL POINTS

31 / 48

QUESTION 1

1 Problem 2-(g) **1 / 3**

✓ **- 2 pts** *What if multiple components with out-degree 0?*

QUESTION 2

2 Problem 5 **21 / 22**

✓ **+ 6 pts** *a correct*

✓ **+ 1.5 pts** *part b correct change*

✓ **+ 1.5 pts** *part b correct running time*

✓ **+ 10 pts** *part c correct*

✓ **+ 2 pts** *partial credit for c*

QUESTION 3

3 Problem 6 **0 / 13**

✓ **+ 0 pts** *Incorrect/Missing Solution*

QUESTION 4

4 Problem 7 **9 / 10**

✓ **- 1 pts** *(a) How do you know the tie-break would be chosen this way?*

2.g. Find the SCCs in a graph.

Now, in the new graph that is formed, the vertex which has no child corresponds to all those vertices v which can be reached from any $w \in W$.

Time Complexity : $O(V+E)$

Ques 5

(c). $Odd_{ij}^{K} = \min\left(odd_{ij}^{K-1}, Even_{ij}^{K-1} + w_{iK}, Even_{ij}^{K-1} + w_{jK}\right)$

$Even_{ij}^{K} = \min\left(Even_{ij}^{K-1}, odd_{ij}^{K-1} + w_{iK}, Odd_{ij}^{K-1} + w_{jK}\right)$

(d) $$Odd_{ij} = \begin{cases} 1 & \text{if } w_{ij} = 1 \\ 0 & \text{else.} \end{cases}$$

$$Even_{ij} = \begin{cases} 0 & \text{if } w_{ij} = 1 \\ 0 & \text{else.} \end{cases}$$

1 Problem 2-(g) **1 / 3**

✓ **- 2 pts** *What if multiple components with out-degree 0?*

2.g. Find the SCCs in a graph.

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Q5 a

$$D^{1} = \begin{bmatrix} 0 & 3 & 8 & \infty & -4 \\ \infty & 0 & \infty & 1 & 7 \\ \infty & 4 & 0 & \infty & \infty \\ 2 & 5 & -5 & 0 & -2 \\ \infty & \infty & \infty & 6 & 0 \end{bmatrix}$$

$$D^{2} = \begin{bmatrix} 0 & 3 & 8 & 4 & -4 \\ \infty & 0 & \infty & 1 & 7 \\ \infty & 4 & 0 & 5 & 11 \\ 2 & 5 & -5 & 0 & -2 \\ \infty & \infty & \infty & 6 & 0 \end{bmatrix}$$

(b) Cost $= D[i,k] * D[k,j]$

if Cost $< D[i,j]$

$D[i,j] =$ Cost

Running time will be the same as for floyd algorithm

i.e. $O(n^3)$

2 Problem 5 **21 / 22**

- ✓ **+ 6 pts** *a correct*
- ✓ **+ 1.5 pts** *part b correct change*
- ✓ **+ 1.5 pts** *part b correct running time*
- ✓ **+ 10 pts** *part c correct*
- ✓ **+ 2 pts** *partial credit for c*

3 Problem 6 **0 / 13**

✓ **+ 0 pts** *Incorrect/Missing Solution*

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Ques 7.

(a) A

1. 10
2. 7
3. C_2
4. S_1
5. 17
6. 5

(b)

1. $2(a-b)$
2. $(x-y)$
3. $(a-x)^2 + (b-y)^2$
4. $(a-y)^2 + (b-x)^2$

Then $Cost\{2,1\} - Cost\{1,2\} = (a-y)^2 + (b-x)^2 - [(a-x)^2 + (b-y)^2]$

$= a^2 + y^2 - 2ay + b^2 + x^2 - 2bx - a^2 - x^2 \cancel{+ 2ax - 2ay - 2by}$

$= 2ax + 2by - 2ay - 2bx$

$= 2[a(x-y) - b(x-y)]$

$= 2.[(a-b)(x-y)]$

As $a \geq b$ & $x \geq y$ {given}

$2(a-b)(x-y) \geq 0$

$\Rightarrow Cost\{2,1\} - Cost\{1,2\} \geq 0.$

Hence proved.

4 Problem 7 **9 / 10**

✓ **- 1 pts** *(a) How do you know the tie-break would be chosen this way?*