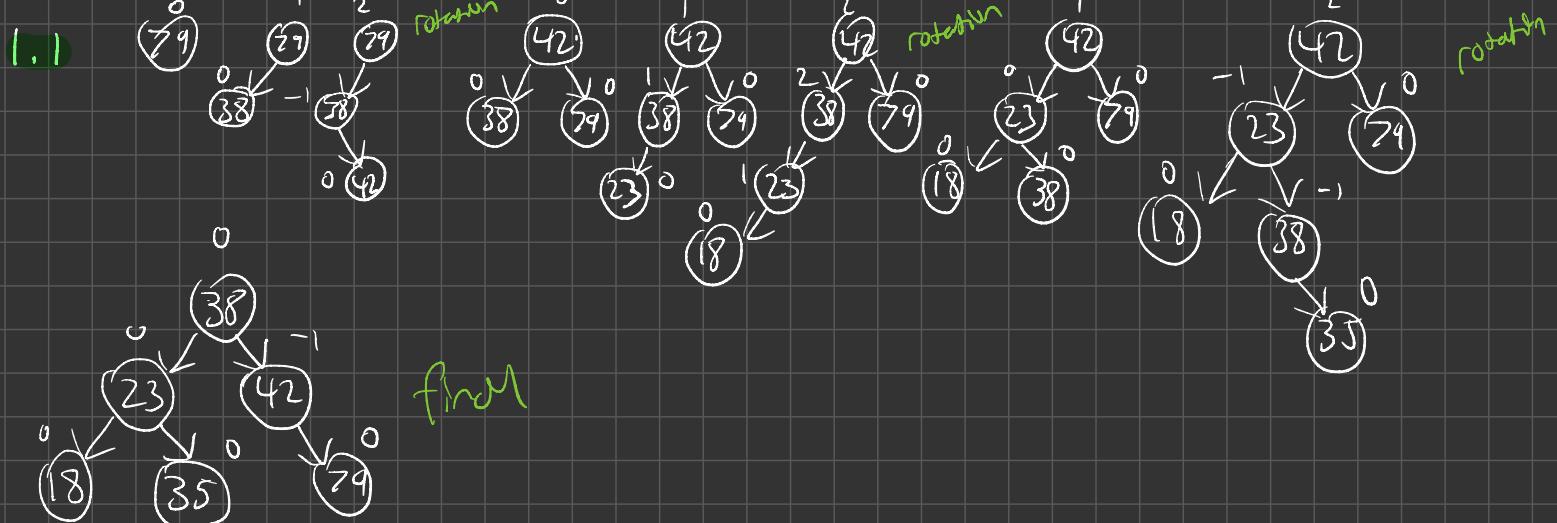
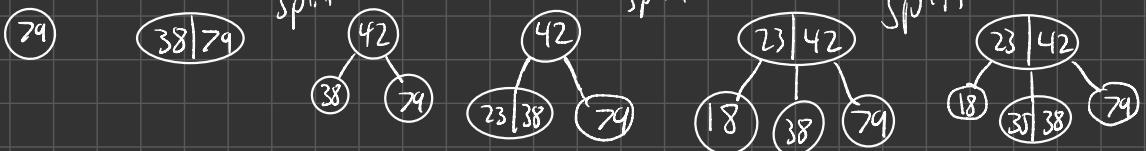


Assignment 5 | Manceesh Wijewardhana | 2022-04-05 | CTS*3490



1.2



2.1 $A = [35 \underline{42} \underline{18} \underline{79} \underline{23} \underline{38}]$

$A = [\underline{35} \underline{42} \underline{38} \underline{79} \underline{23} \underline{18}]$

$A = [\underline{35} \underline{79} \underline{38} \underline{42} \underline{23} \underline{18}]$

$A = [\underline{42} \underline{23} \underline{38} \underline{35} \underline{23} \underline{18}]$ Final Swap

$A = [\underline{79} \underline{42} \underline{38} \underline{35} \underline{23} \underline{18}]$

2.2 $A = [\underline{79} \underline{42} \underline{38} \underline{35} \underline{23} \underline{18}]$

$A = [\underline{18} \underline{42} \underline{38} \underline{35} \underline{23} \underline{79}]$) heapify

$A = [\underline{42} \underline{35} \underline{38} \underline{18} \underline{23} \underline{79}]$) heapify

$A = [\underline{23} \underline{35} \underline{38} \underline{18} \underline{42} \underline{79}]$) heapify

$A = [\underline{38} \underline{15} \underline{23} \underline{18} \underline{42} \underline{79}]$) heapify

$A = [\underline{18} \underline{15} \underline{23} \underline{38} \underline{42} \underline{79}]$) heapify

$A = [\underline{35} \underline{18} \underline{23} \underline{38} \underline{42} \underline{79}]$) heapify

$A = [\underline{23} \underline{18} \underline{35} \underline{38} \underline{42} \underline{79}]$) heapify

$A = [\underline{18} \underline{23} \underline{35} \underline{38} \underline{42} \underline{79}]$) heapify

$$2.3 \quad A = [79 | 42 | 38 | 35 | 23 | 18]$$

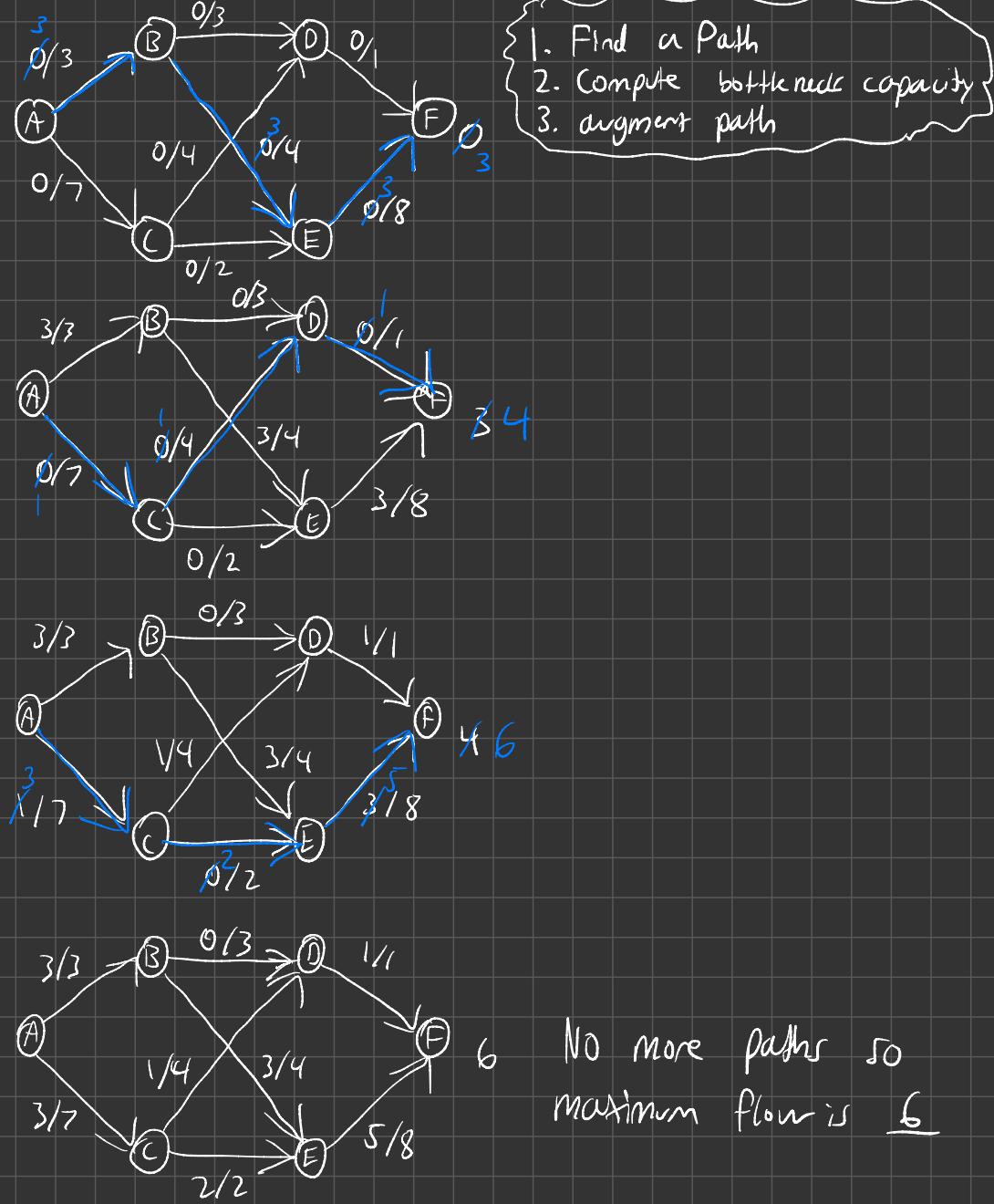
$$A = [18 | 42 | 38 | 35 | 23 | 79] \quad \text{removing and downheap}$$

$$A = [42 | 35 | 38 | 18 | 23]$$

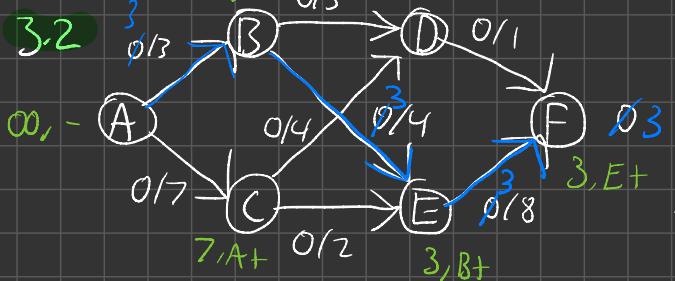
$$A = [42 | 35 | 38 | 18 | 23 | 40] \quad \text{insert and upheap}$$

$$A = [42 | 35 | 40 | 18 | 23 | 38]$$

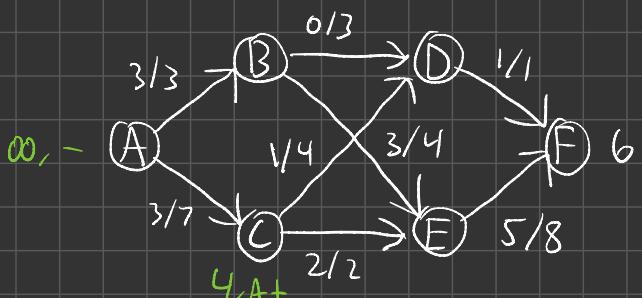
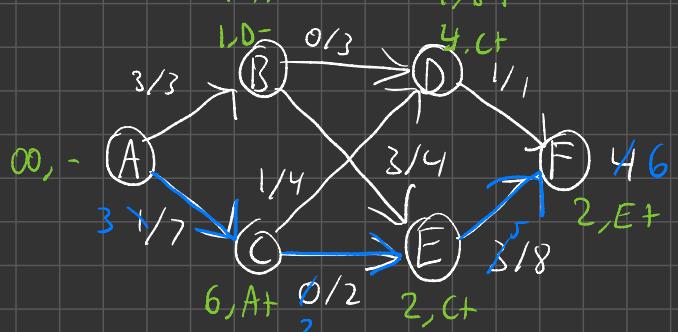
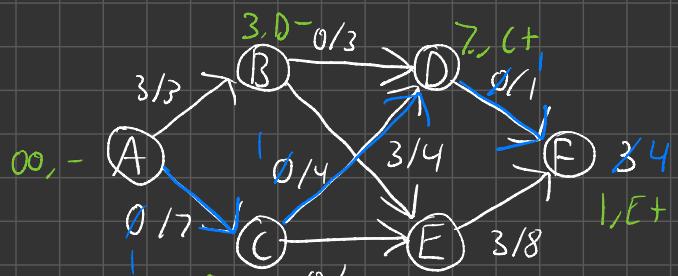
3.1



First label refers to the amount of additional flow that can be brought from the source to the vertex being labeled



Second label refers to the name of the vertex from which the vertex being labeled was reached +, -, indicates whether the vertex was reached via forward or backward edge



No augmenting path so current flow is max which is 6

4.1
1. C

2. C

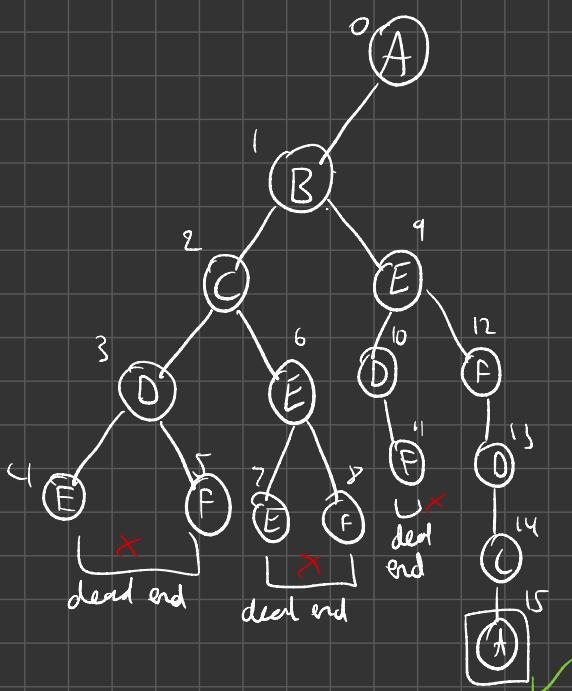
3. d

4. C

5. C

- 4.2
- Impossible - P, NP, and NPC are not the same and so are not equivalent
 - Impossible - There are problems in NP that do not belong in NPC
 - Impossible - There are no problems that are both P and NPC
 - Possible - NP being the universal set is fine since P and NPC are problems that are also NP type. Also, there are no problems that are both P and NPC.

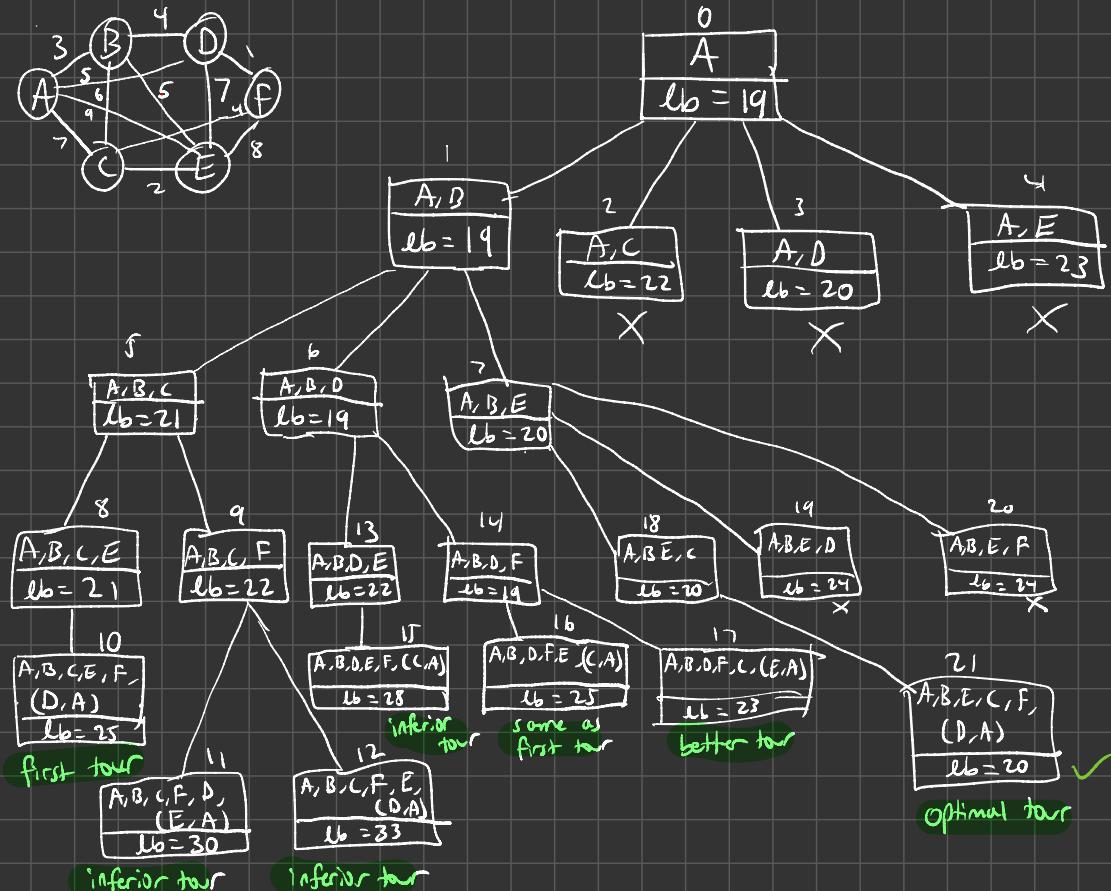
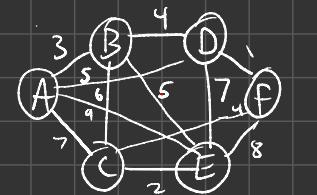
5.1



NOTE: Virtually there are 2 possible cycles but I went alphabetically and found the first one.

5.2 $LB = \lceil s/2 \rceil$

$$LB = \lceil ((3+5) + (3+4) + (4+2) + (4+1) + (2+5) + (1+4)) / 2 \rceil = 19 \quad \nearrow \begin{matrix} \text{initial} \\ \text{lower} \\ \text{bound} \end{matrix}$$



	0	1	2	3	4	5	6	7	8	9	W=11
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	42	42	42	42	42
2	0	0	0	12	12	12	12	42	42	42	42
3	0	0	0	12	40	40	40	52	52	52	54
4	0	0	0	12	40	40	40	52	52	65	82

$$w_1 = 7, v_1 = 42$$

$$w_2 = 3, v_2 = 12$$

$$w_3 = 4, v_3 = 40$$

$$w_4 = 5, v_4 = 25$$

∴ best value we can get is 82

item	weight	value	value/weight
1	7	42	6
2	3	12	4
3	4	40	10
4	5	25	5

$$\text{Capacity } W = 11$$

Subset	added items	value
\emptyset	3, 1	82
{1}	3	82
{2}	3	52
{3}	1	82
{4}	3	65
{1, 2}		54
{1, 3}		82
{1, 4}	not feasible	
{2, 3}		52
{2, 4}		37
{3, 4}		65

$$\text{Accuracy ratio: } f(s^*) / f(S_a)$$

$$82 / 82$$