Name:

ID:

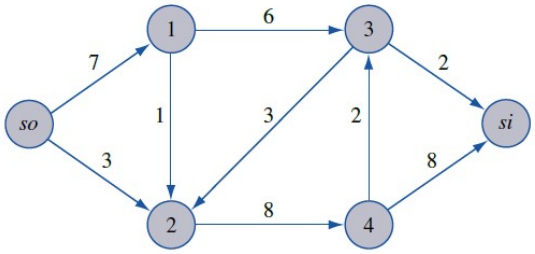
Section:

IE 400-HOMEWORK 3

Spring 2020

Do not forget to write the Honor code and sign it

Question 1. Find the maximum flow from source node to sink node. Also, find a cut whose capacity equals to the maximum flow. Can we find a cut whose capacity is smaller than the cut that you found? Please explain clearly each step and use Ford-Fulkerson algorithm.



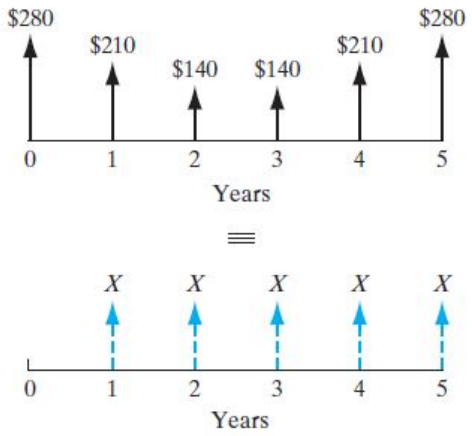
Question 2. The Table shows the information related to a project that involves the merger of two marketing firms (in days).
a) Draw the project network.
b) Develop the project schedule (ES, EF, LS, LF).
c) What are the critical activities?
d) What is the project duration?
e) If there is an option to delay one activity without delaying the entire merge project, which activity would you delay, why?
f) Formulate the LP model that would determine the earliest start time of activities.

Activity	Immediate predecessor(s)	Estimated duration(days)
A	—	10
B	—	15
C	A	5
D	B	12
E	C, D	14
F	B	8
G	D, F	15
H	E	10
I	E, G	6
J	F, I	9

Question 3. An electronic device consists of three components. The failure of at least one component causes the failure of the device. The reliability (probability of no failure) of the device can be improved by installing one or two standby units of each component. The following table charts the reliability, r, and the cost, c. The total capital available for the construction of the device is 10,000 dollar. How should the device be constructed to have maximum reliability? (Remark: The reliability of the device is equal to the multiplication of the individual reliabilities of the components, that is, $r_1 r_2 r_3$.) Solve this problem using dynamic programming. Clearly state your function, initial or ending conditions, and the recursive relationship. Report the optimal solution as well as the optimal value. Hint: Let $f_k(d)$ be the maximum reliability with components k and an available capital of d dollars.

No of parallel units	Component 1		Component 2		Component 3	
	r_1	$c_1(\$)$	r_2	$c_2(\$)$	r_3	$c_3(\$)$
1	0.6	1000	0.7	3000	0.5	2000
2	0.8	2000	0.8	5000	0.7	4000
3	0.9	3000	0.9	6000	0.9	5000

Question 4. a) The two cash flow transactions shown in the accompanying cash flow diagram are said to be equivalent at 9% interest compounded annually. Find the unknown value of X that satisfies the equivalence.



b) Consider the following sequence of deposits and withdrawals over a period of four years. If you earn 10% interest on your deposits, how much will you able to withdraw at the end of four years?