CSC 226

Assignment 1

V00897211

1)

a)

0	→	1
1	→	4→5
2	→	3→5
3	→	2→5
4	→	0→1→5→6→8
5	→	1→2→3→4→6→7
6	→	4→5→7→8
7	→	5→6→8
8	→	4→6→7

b)

	0	1	2	3	4	5	6	7	8
0	0	0	0	0	1	0	0	0	0
1	0	0	0	0	1	1	0	0	0
2	0	0	0	1	0	1	0	0	0
3	0	0	1	0	0	1	0	0	0
4	1	1	0	0	0	1	1	0	1
5	0	1	1	1	1	0	1	1	0
6	0	0	0	0	1	1	0	1	1
7	0	0	0	0	0	1	1	0	1
8	0	0	0	0	1	0	1	1	0

2)

$m = n - k$

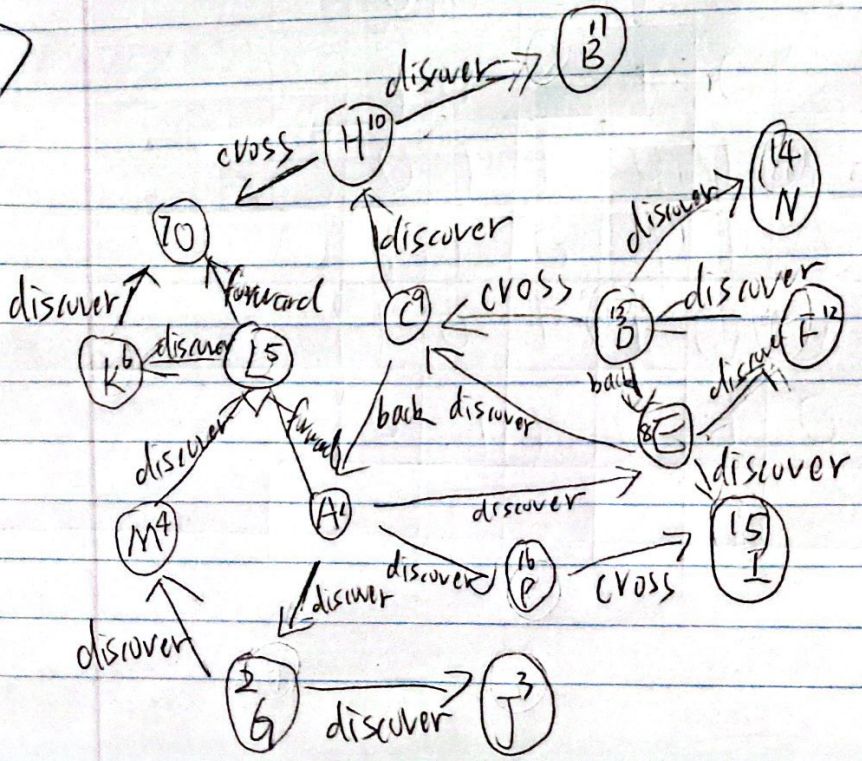
For 1 connected component, consider a tree has no cycle, so if a tree has n vertices, it must have n-1 edges.

For 2 connected components, if a graph has n vertices, it must have n-2 edges.

For 3 connected components, if graph has n vertices, it must have n-3 edges.

∴ For k connected components, if a graph have n vertices it must have n-k edges that is $m = n - k$.

3)



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G10

	1	2	3	4	5	6
1	0	1	0	0	0	1
2	0	0	0	0	0	0
3	1	0	0	1	1	0
4	0	0	0	0	1	0
5	0	0	0	0	0	0
6	0	0	1	0	0	0

G1

	1	2	3	4	5	6
1	0	1	0	0	0	1
2	0	0	0	0	0	0
3	1	1	0	1	1	1
4	0	0	0	0	1	0
5	0	0	0	0	0	0
6	0	0	1	0	0	0

6.2

	1	2	3	4	5	6
1	0	1	0	0	0	1
2	0	0	0	0	0	0
3	1	1	0	1	1	1
4	0	0	0	0	1	0
5	0	0	0	0	0	0
6	0	0	1	0	0	0

- 2. current value

6.3

	1	2	3	4	5	6
1	0	1	0	0	0	1
2	0	0	0	0	0	0
3	1	1	0	1	1	1
4	0	0	0	0	1	0
5	0	0	0	0	0	0
6	1	1	1	1	1	0

6.4

	1	2	3	4	5	6
1	0	1	0	0	0	1
2	0	0	0	0	0	0
3	1	1	0	1	1	1
4	0	0	0	0	1	0
5	0	0	0	0	0	0
6	1	1	1	1	1	0

G5

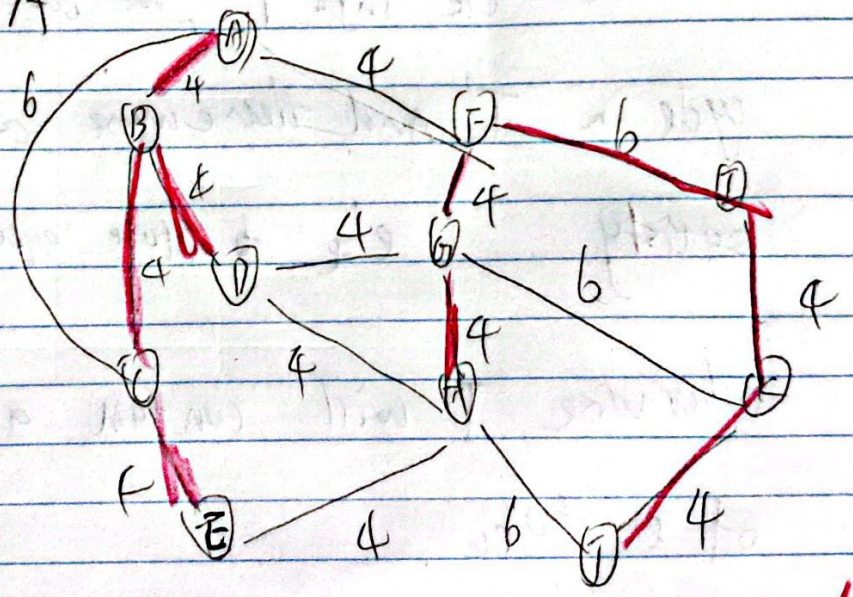
	1	2	3	4	5	6
1	0	1	0	0	0	1
2	0	0	0	0	0	0
3	1	1	0	1	1	1
4	0	0	0	0	1	0
5	0	0	0	0	0	0
6	1	1	1	1	1	0

G6

	1	2	3	4	5	6
1	0	1	1	1	1	1
2	0	0	0	0	0	0
3	1	1	0	1	1	1
4	0	0	0	0	1	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0

5) Start from A

select A → B
select B → C
select B → D
select C → G
select A → F
select F → G
select G → H
select F → I
select I → K
select C → J



MST show in Red.

Hilroy

6) Assume that there are more than one MST for G, we select 2 MST, named T, and T' both of the weight is W

Assum T is made edge $e_1, e_2, e_3 \ldots e_n$, in ascending order

Assum T' is made edge $e_1', e_2', e_3' \ldots e_n'$ in ascending order

We find minimum k

satisfy $e_k != e'_k$.

We add e_k into T', we can find that there is a cycle in T' And there must exist one edge e'_t satisfy e'_t 的 value equal to $e_1, e_2, e_3 \ldots e_{k-1}$

Otherwise T will contain a cycle made up of e_1 to e_k.

Then, we remove e'_t from T, we will get a MST

MST total less than T', That is b/c
e't > ec.
this means T' is not a MST.

∴ Assumption is wrong. There is only
one MST for this ~~graph~~ graph.