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Assignment 1 : CS 5084

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Answer 2 :-

As per given example

m - w & w - m

are the preferences.

The answer is True, since there are no other pair of men & women involved & they are only pair to match. Also, two people can only be matched together if they are in each other's preference. Hence in every stable matching S(m,w) is correct / True.

Answer 3 :-

As per given statement :- 'A' & 'B' are 2 counterparties 'S' & 'T' as their schedules. (S,T)

As an Analouge of Gale-Shapley algorithm.

A & B should have list of time slots
A will have prefered time slot that B has not filled yet.
- if the time slot is not filled then A gets the slot with show which has higher rating than currently scheduled it should accept & moves the current show to next time slot
-

if the time slot is filled & show of 'A' network has lower rating than the show that is currently scheduled, it will reject the proposal.

Similarly B will be following the same steps.

And it can be proven with Gale-shapely algo. that stable matching could be formed therefore, We can assume that it will also produce with stable pair of schedules & either one of 'A' or 'B' will win.

Answer 5:

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(a) Let us Consider ex: where man 'm' & women 'w' prefer each other over their current partners in a perfect matching.

In this case we

Man	preference →			Women	Preference →		
M_1	W_3	W_2	W_1	W_1	M_3	M_1	M_2
M_2	W_3	W_1	W_2	W_2	M_3	M_2	M_1
M_3	W_1	W_2	W_3	W_3	M_1	M_2	M_3
	higher		lower		higher		lower

here, in this example both Man & woman counterparties has preference list with same order so every man & woman is indifferentiate between all other men & women. Thus for every matching, at least one man & women would prefer to be matched with someone else, which leads to → Strong Instability in every perfect matching.

(b) (Consider) Answer 5(b).

(b)

Consider following ex:

Men	preferences	Women	preferences
M_1	$W_2 > W_1 > W_3 > W_4$	W_1	$M_3 > M_1 = M_4 > M_2$
M_2	$W_3 > W_1 = W_2 > W_4$	W_2	$M_1 > M_4 > M_2 = M_3$
M_3	$W_1 > W_2 > W_4 > W_3$	W_3	$M_2 > M_3 = M_4 > M_1$
M_4	$W_4 > W_2 > W_1 > W_3$	W_4	$M_1 > M_2 > M_1 > M_3$

In this ~~given~~ example. we can see (~~M_2 ...~~) ~~M_2, W_3~~ have ties in the preference list.

→ ($m_2 w_1$) ($W_3 M_3$)

Accord. to gale shapely stable matching canbe given as

$M1-W_2$, $M2-W3$, $M3-W1$, $M4-W4$

in this matching no weak instability exist as no other man or woman prefers someone else over their current partner.

if we change of preference list of M_1 & W_2 as

$M1$ - $W_2 > W_3 > W_1 > W_4$

W_2 - $M_1 > M_4 > M_2 = M_3$

~~using the G~~ now in this case stable matching would be:

$M_1 - W_2$, $M_2 W1$, $M3 W3$ & $M4 W4$

but in this matching weak instability exist because $M1$ prefer "W_2" over "W_1" but W_2 is indifferentiate between M_1 & M_4.

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8) Answer 8:

Case (b)

Consider an example for 3 men & 3 women with their preference list given.

Men	↑	↓
M1	W1	W3 W2
M2	W2	W1 W3
M3	W3	W2 W1

Women	↑	↓
W1	M1	M2 M3
W2	M3	M1 M2
W3	M2	M3 M1

If W1 switches her preference list as:
W1 M2 M3 M1 (M2 being higher pref.)
& try applying Gale-Shapely Algo. then W1 would match with M1 even if she secretely prefers M2

Also, it is not sure as per Gale-Shapely's algo. if there will be stable matching if any one of the single entity from the one of the counter parties is lying about his/her preference list.