Suppose you are a gambler; you have brought a lottery game ticket where you need to guess the lottery number. You will receive a "Toyota Premio" if your similarity is 80-89%, a "Toyota Prado" if your similarity is 90-99%, and prize money of "10 Crores TK" if your similarity is 100%. Let's see how fortunate you really are, shall we?
String1(Lottery Answer) = 244663
String2(Your Answer) = 214663

a) [CO6] **Develop/Design** an algorithm to determine the similarity of your lottery number, calculate the percentage similarity between String1 and String2, and calculate your price? (mention the name of the algorithm, show simulation and final calculation with necessary step) [1+6+1]

[Hint: For calculating percentage similarity: Similarity = (Output/Length of the sample) *100]

a) Using dynamic programming and the LCS approach:

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

∴ Percentage similarity:

$= \frac{5}{6} \times 100$

$= 83.3\%$

∴ ~~Price~~ Prize:

"Toyota Premio"

∴ Price → 8.3 crore

[CO2] Suppose, you have $10 to buy food for a day. You have several options, but you need to maximize total calories from the food items for longer survival. Apply Proper technique to choose the items so that you can have maximum calories from the given amount of money.**You are not allowed to waste any food, so if you choose an item, you will eat it completely.**

Item	Price	Calories
Cheese Burger	$3	250 cal
Pizza	$2	290 cal
Chicken fry	$3	225 cal
Fried rice	$4	295 cal
Salad	$1	200 cal

(i) Apply proper technique to find the maximum calorie you can eat. [8 mark]
(ii) Write and simulate the algorithm to find the selected items for optimal calorie intake within $10 [2 mark]

SOLVE : As, it is clearly said that food isn't allowed to be wasted so it is clearly a binary knapsack problem.

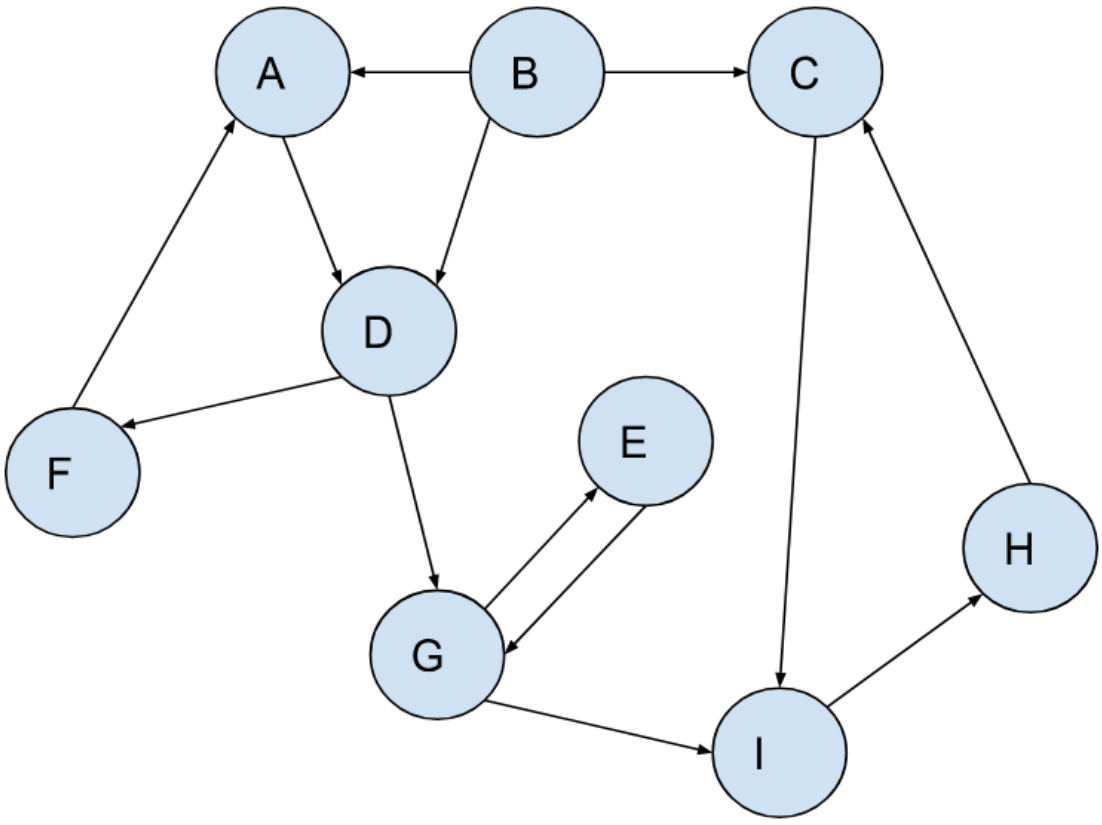
You can take Price as your Item_weight and Calories as your item_price to solve.

0	0	0	0	0	0	0	0	0	0	0
0	0	0	250	250	250	250	250	250	250	250
0	0	290	290	290	540	540	540	540	540	540
0	0	290	290	290	540	540	540	765	765	765
0	0	290	290	295	540	585	585	765	835	835
0	200	290	490	490	540	740	785	785	965	**1035**

Ichigo has to save his friends who are lost in a labyrinth made by the evil "Grand Fisher". The labyrinth consists of "mystery rooms"(shown as nodes) and "doors"(shown with arrows) to go into another mystery room. A "mystery hub" is a collection of rooms where there is always a path from any room to any other room inside the hub. The only way Ichigo can save his friends is if he can tell Grand Fisher the number of hubs that exist in the labyrinth. Ichigo found the hidden map of the labyrinth shown below, but the hubs are not marked in it. Apply a suitable algorithm to mark the hubs and help Ichigo save his friends!

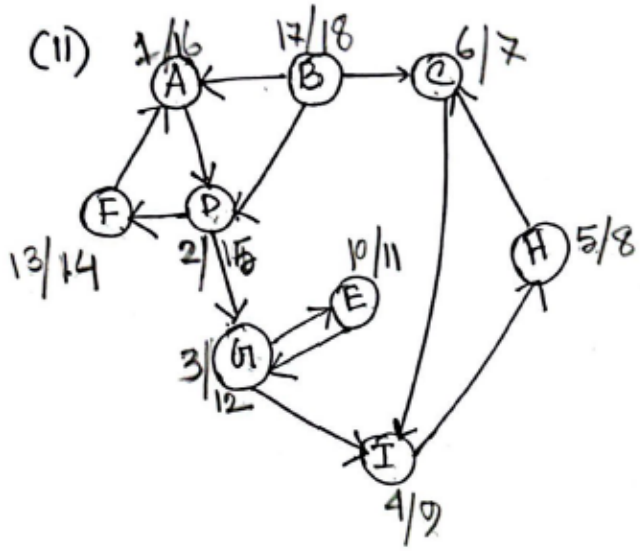
i) State the name of the algorithm you are gonna use

ii) **Show** the simulation step by step to mark the hubs and help Ichigo save his friends!

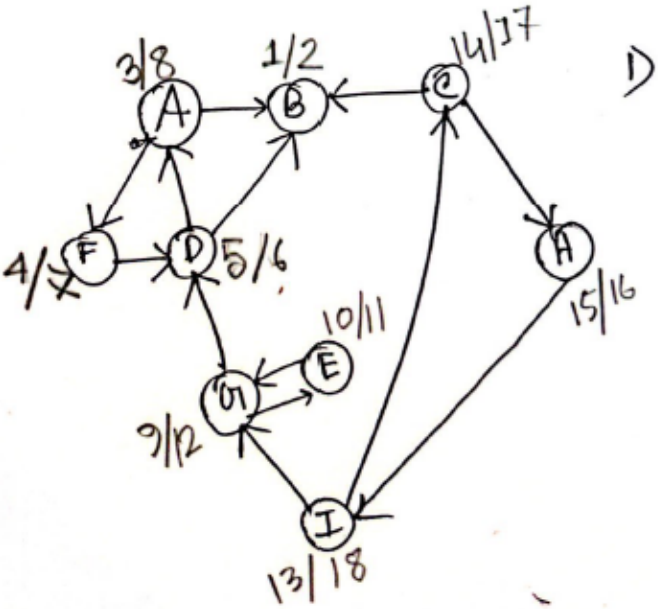


D scc (kosaraju)
strongly connected components.

(11)



B A D E F D G E H I C



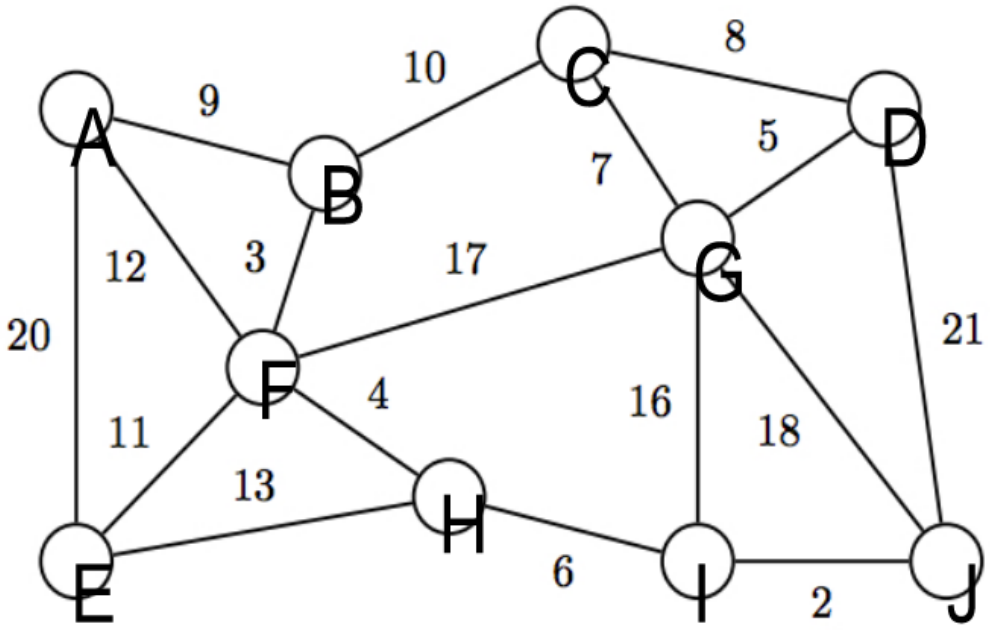
1) {B}
2) {AFD}
3) {GE}
4) {ICH}

Dhaka, especially your area, is facing an Electricity crisis. Many initiatives including loadshedding, reducing office hours, etc have already been taken. The local authority of your area is looking for feasible solutions to reduce the consumption of electricity. One of the members of their advisory committee has suggested that they should reduce the operating costs of road lighting. Till Now every road is illuminated all night long. To reduce electricity consumption, they have decided to no longer illuminate every road, but to switch off the road lighting of some roads. To make sure that the inhabitants of your area still feel safe, they want to optimize the lighting in such a way that after darkening some roads at night, there will still be at least one illuminated path from every major point in your area to every other major point.

Apply a suitable Algorithm to help the authority determine the roads they need to keep and the cost which will minimize the electricity consumption. If you need to consider any root vertex for your Algorithm, you can consider 'A' as such.

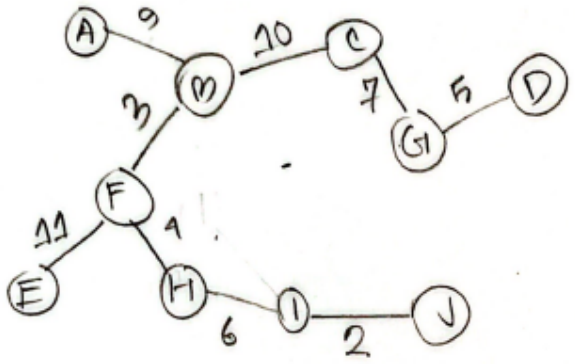
i) State the name of the algorithm [2]

ii) Use the algorithm and show the simulation step by step [8]



i) Minimum Spanning Tree → Prim's Algorithm

ii)



Cost = 57

MST

I → 2 (IJ), 6 (IH), 16 (IG)

H → 4 (HF), 13 (HE)

F → 3 (FB), 11 (FE), 12 (FA)

B → 9 (BA), 10 (BC)

A → 20 (AE)

C → 7 (CG), 8 (CD)

G → 5 (GD), 16 (GI), 18 (GJ)

D → 21 (DJ)