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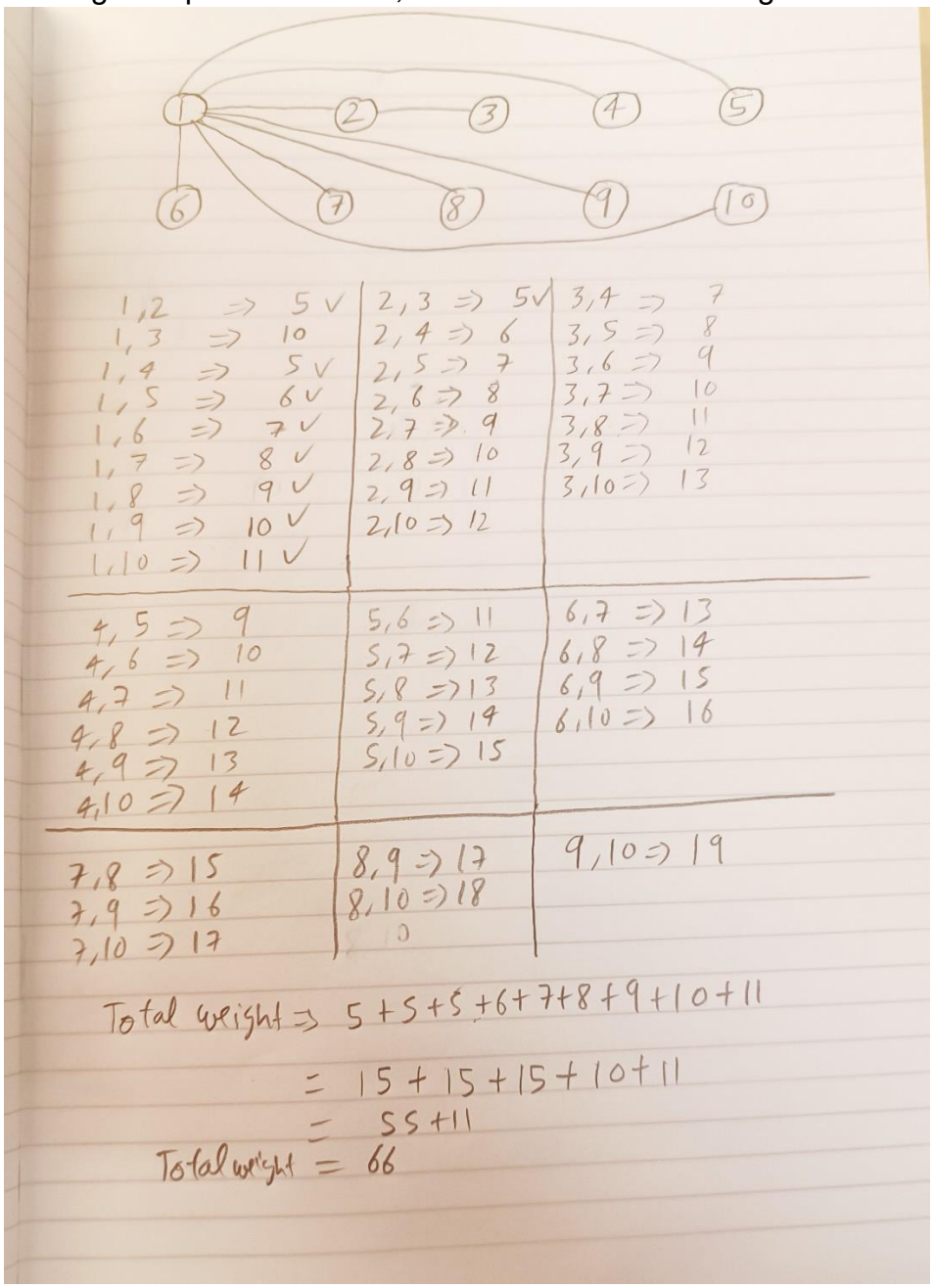
CS202-1

Question 1

$$w_{ij} = \begin{cases} i + j, & if\ i + j \geq 5 \\ \mathrm{i}^2 + \mathrm{j}^2, \mathrm{if\ i + j < 5} \end{cases}$$

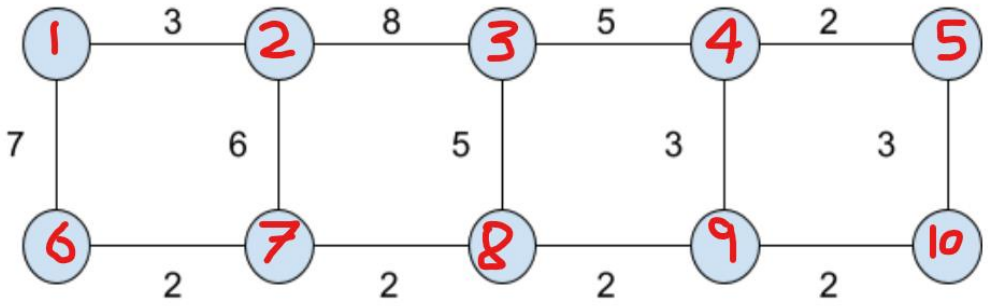
In the given question N = 10, so for MST number of edges would be 9.



In the above image we can see the calculations done, we calculated the weight for all edges without repeating the reversed edges, like I calculated 1,2 not 2,1 because that would be unnecessary. Then in those edges I choose minimum weight edges to make connection in such a way that a minimum spanning tree is created. After summing up the 9 edges used in the MST, I got the weight of 66.

Answer → Weight = 66.

Question 2



I will be using the Prim's algorithm. In the diagram above I have given room numbers as can be seen.

Steps: (Note: When 2 rooms connected to MST had the same weight, I choose the numerically smaller room for consistency)

Start from an arbitrary node. I will start at Room 1.

Add Room 1 to the MST.

Add the smallest edge connected to MST which is room 2 here with edge weight 3.

Add the smallest edge connected to MST which is room 7 connected to room 2 with edge weight 6.

Add the smallest edge connected to MST which is room 6 connected to room 7 with edge weight 2.

Add the smallest edge connected to MST which is room 8 connected to room 7 with edge weight 2.

Add the smallest edge connected to MST which is room 9 connected to room 8 with edge weight 2.

Add the smallest edge connected to MST which is room 10 connected to room 9 with edge weight 2.

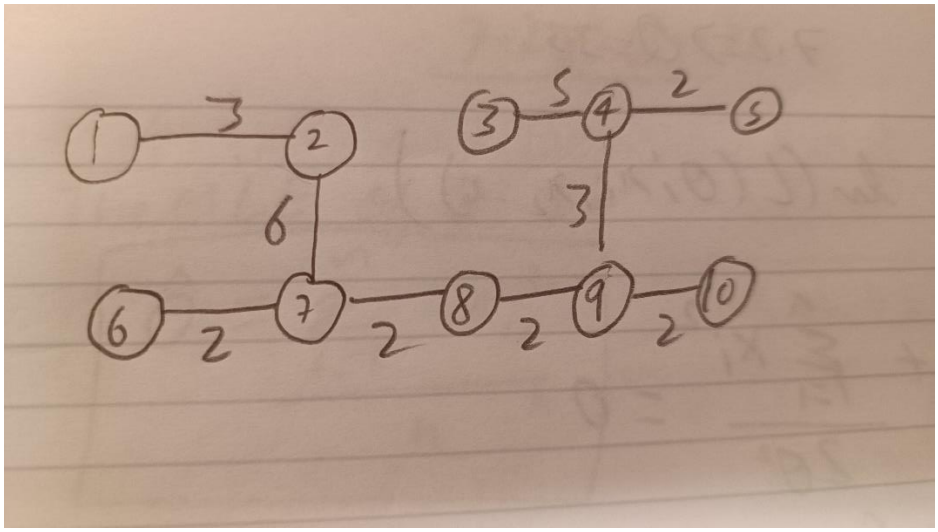
Add the smallest edge connected to MST which is room 4 connected to room 9 with edge weight 3.

Add the smallest edge connected to MST which is room 5 connected to room 4 with edge weight 2.

Add the smallest edge connected to MST which is room 3 connected to room 4 with edge weight 5.

All vertices are now included successfully in MST.

Final MST can be seen in below image:



The weight of the MST is calculated by adding the edges which gives us a weight of 27.

Weight = 27.