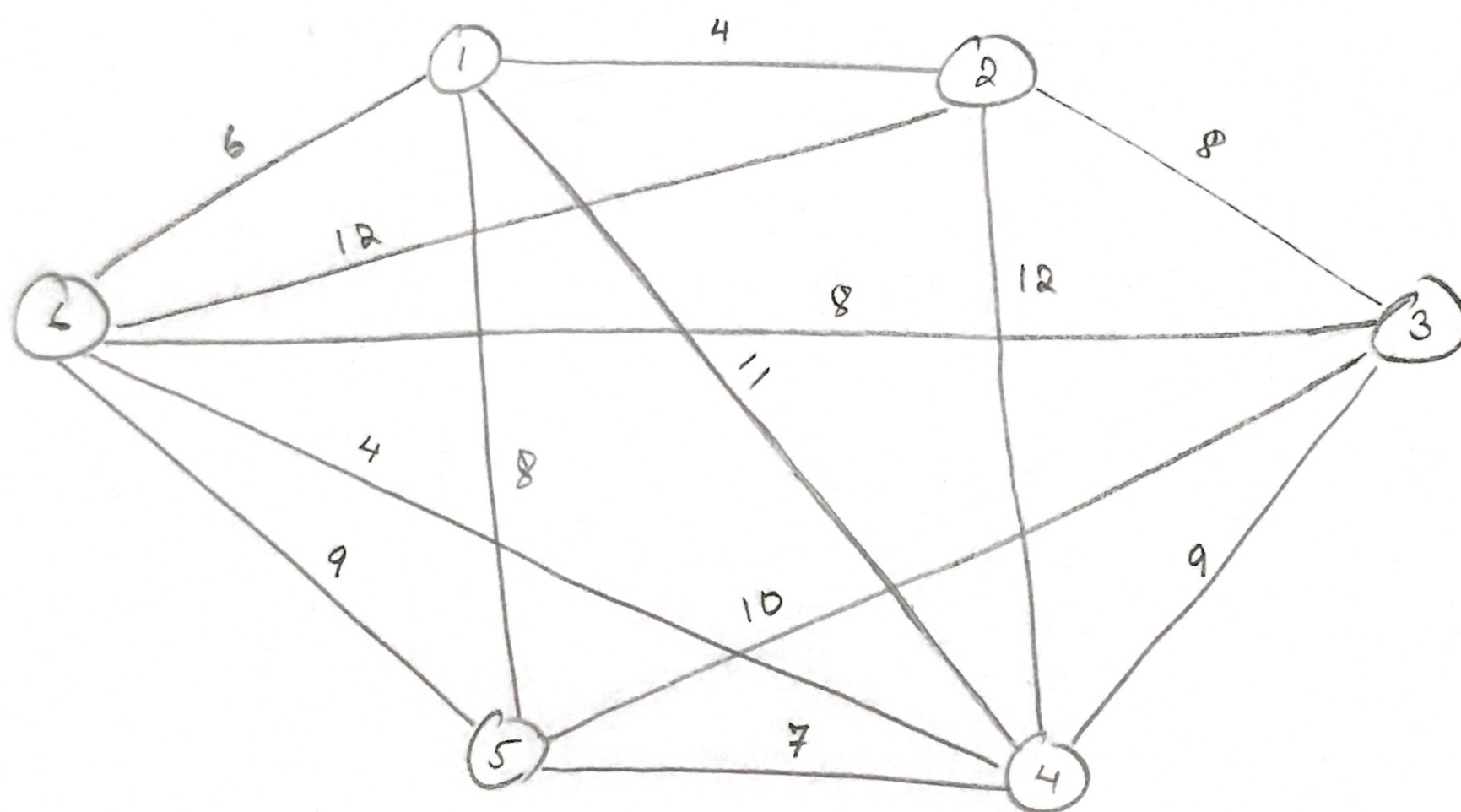


Q.4

Assume we have 6 villages:

Building a graph using provided adjacency  
matrix.



Now by definition we know minimum spanning tree:

A tree with a weighted graph is a sub-graph of graph that is connected and has no cycle and has the least possible amount of edges.

→ Next page

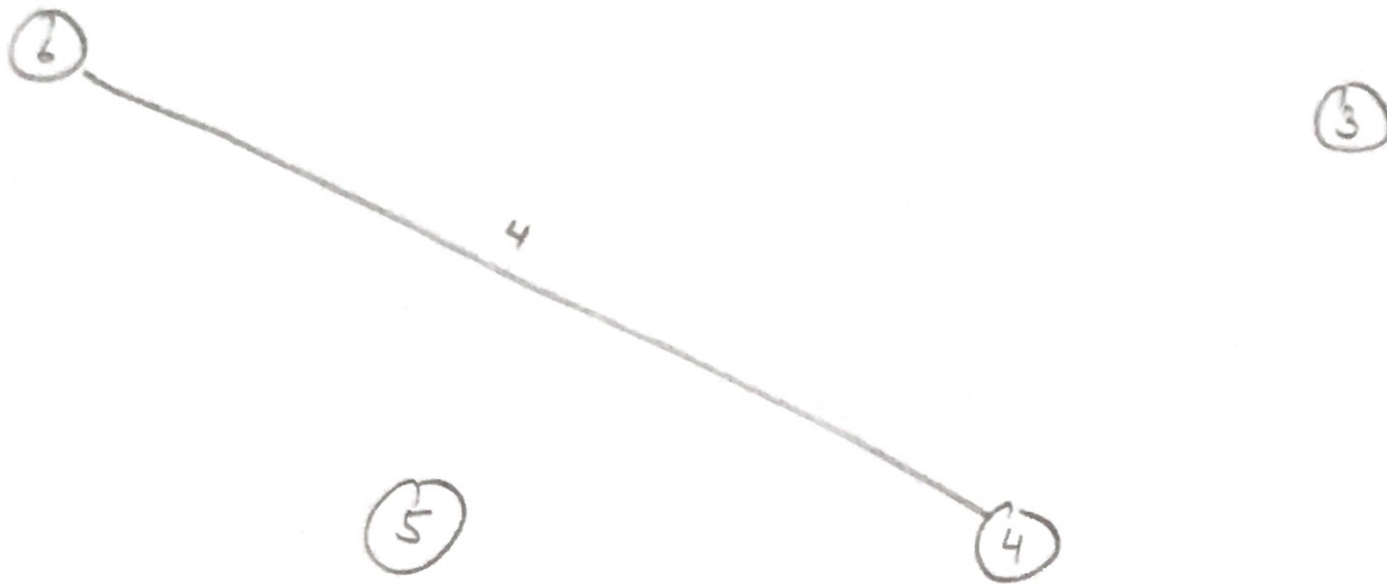
Now, using Kruskal's algorithm:

- ① we begin by taking the edge of least weight.
- ② Then we take the next edge of least weight and so on.
- ③ If the edge forms a cycle then we disregard that edge and then take the next least weight.
- ④ The process will run and finally stop if edges taken are incident on every vertex of the graph.

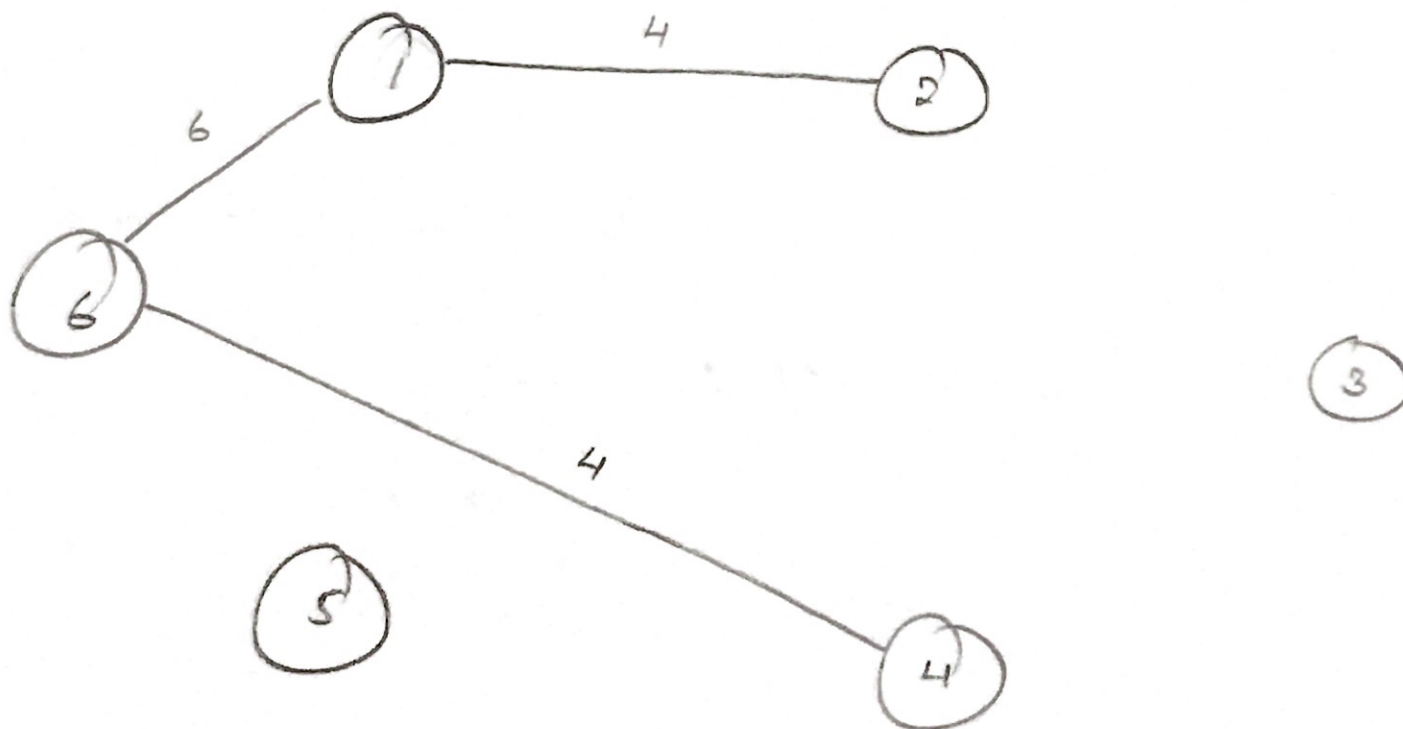
Now steps to building minimum spanning tree has been shown below:

- ① We take the edge with least weight which are between the pairs:  $(1, 2)$ ,  $(4, 6)$ . we consider these because they do not form any cycle and represent the least weight.





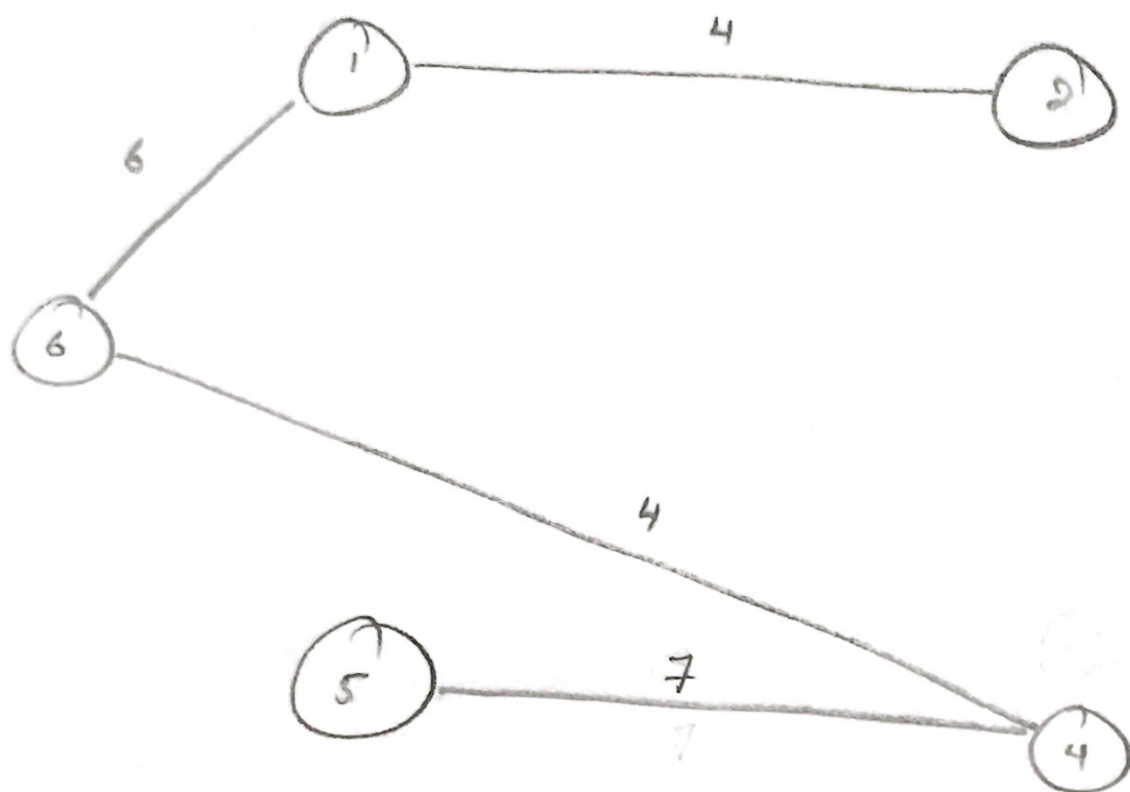
② The edge of next least weight 6 is (1, 6) and also does not form any cycle.





3)

The edge of the next least weight 7 is  $(4, 5)$  and also does not form any cycle.

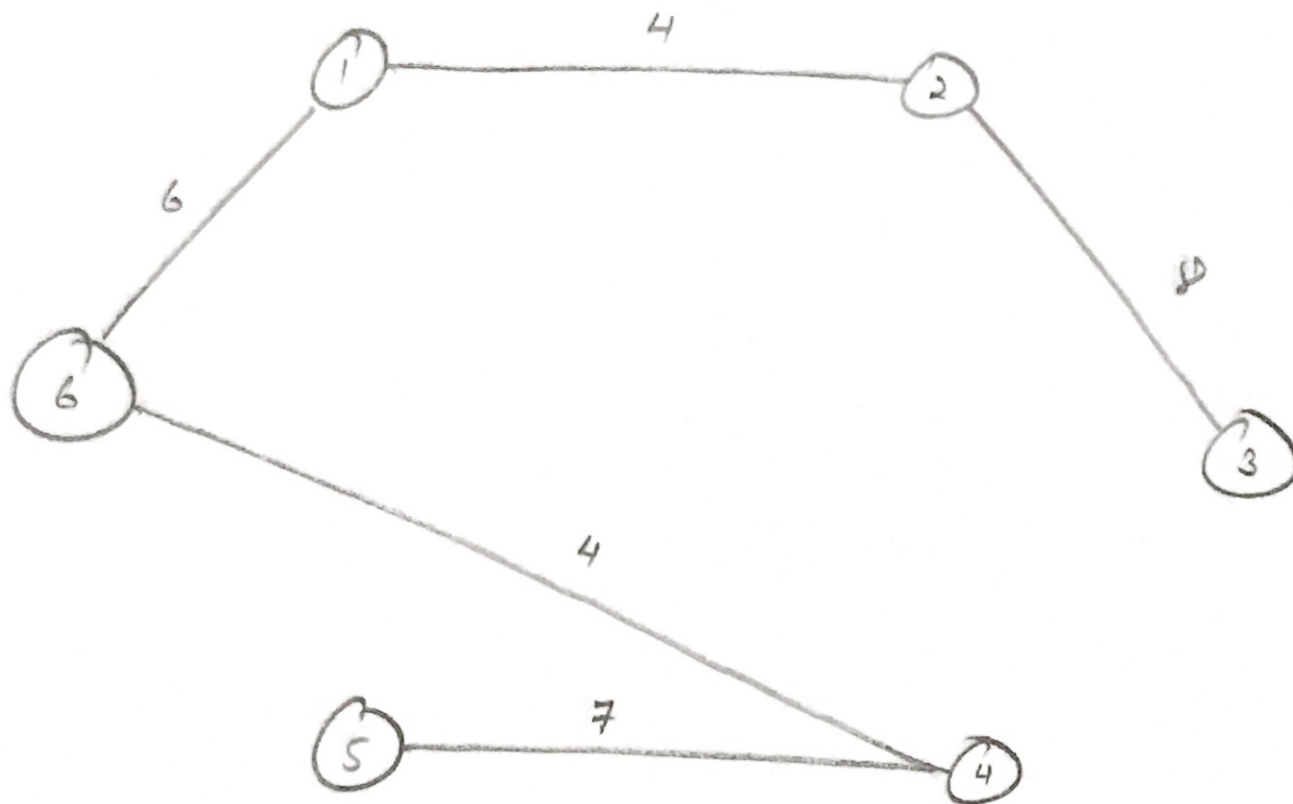


3

4)

Now the edges of the next least weight 8 are  $(1, 5)$ ,  $(2, 3)$  and  $(3, 6)$  of which  $(1, 5)$  will form a cycle  $(1-5-4-6-1)$  and adding both  $(2, 3)$  and  $(3, 6)$  together will also give us a cycle.   
  $\therefore$  If we add only one of them at  $(2, 3)$  then no cycle is formed.





Conclusion:

We can see that all edges considered are incident on all vertices of the graph.

So, the network connecting all the villages together can be made by constructing roads between

villages:  $(3,2), (2,1), (1,6), (6,4), (4,5)$

Also total minimum cost for connecting the

$$6 \text{ villages} : 8 + 4 + 6 + 4 + 7 = \boxed{29}$$