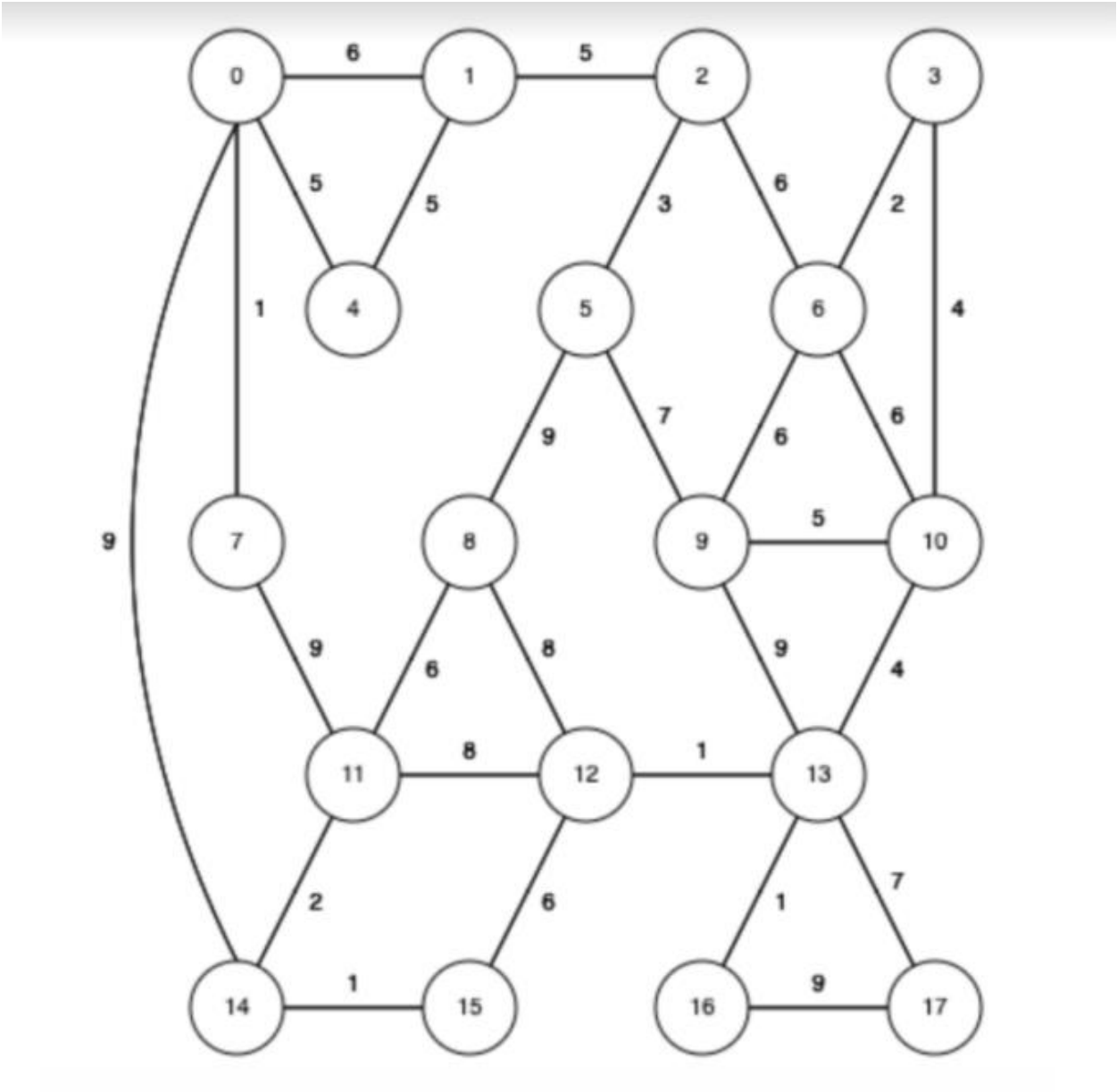
20125038 -LeNguyenQuangMinh

3.1. Assignment 1 – Paper assignment

Given the below weighted graph, you are asked to demonstrate step by step how to:



1. **Find the shortest paths from vertex 0 to all other vertices using Dijkstra's algorithm. For each pair of vertices, write down the total weight and list of vertices on the path.**

Start from 0

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	6			5			1							9			

Choose 7 :

0	1	2	3	4	5	6	**7**	8	9	10	11	12	13	14	15	16	17
	6			5			1				10			9			

Choose 4 :

0	1	2	3	**4**	5	6	**7**	8	9	10	11	12	13	14	15	16	17
	6			5			1				10			9			

Choose 1 :

0	**1**	2	3	**4**	5	6	**7**	8	9	10	11	12	13	14	15	16	17
	6	11		5			1				10			9			

Choose 14 :

0	**1**	2	3	**4**	5	6	**7**	8	9	10	11	12	13	**14**	15	16	17
	6	11		5			1				10			9	10		

Choose 11 :

0	**1**	2	3	**4**	5	6	**7**	8	9	10	**11**	12	13	**14**	15	16	17
	6	11		5			1	16			10	18		9	10		

Choose 15 :

0	**1**	2	3	**4**	5	6	**7**	8	9	10	**11**	12	13	**14**	**15**	16	17
	6	11		5			1	16			10	16		9	10		

Choose 2 :

0	**1**	**2**	3	**4**	5	6	**7**	8	9	10	**11**	12	13	**14**	**15**	16	17
	6	11		5	14	17	1	16			10	16		9	10		

Choose 5 :

0	**1**	**2**	3	**4**	**5**	6	**7**	8	9	10	**11**	12	13	**14**	**15**	16	17
	6	11		5	14	17	1	16	21		10	16		9	10		

Choose 8 :

0	**1**	**2**	3	**4**	**5**	6	**7**	**8**	9	10	**11**	12	13	**14**	**15**	16	17
	6	11		5	14	17	1	16	21		10	16		9	10		

Choose 12 :

0	**1**	**2**	3	**4**	**5**	6	**7**	**8**	9	10	**11**	**12**	13	**14**	**15**	16	17
	6	11		5	14	17	1	16	21		10	16	17	9	10		

Choose 6 :

0	**1**	**2**	3	**4**	**5**	**6**	**7**	**8**	9	10	**11**	**12**	13	**14**	**15**	16	17
	6	11	19	5	14	17	1	16	23	23	10	16	17	9	10		

Choose 13 :

0	**1**	**2**	3	**4**	**5**	**6**	**7**	**8**	9	10	**11**	**12**	**13**	**14**	**15**	16	17
	6	11	19	5	14	17	1	16	23	21	10	16	17	9	10	18	24

Choose 16 :

0	**1**	**2**	3	**4**	**5**	**6**	**7**	**8**	9	10	**11**	**12**	**13**	**14**	**15**	**16**	17
	6	11	19	5	14	17	1	16	23	21	10	16	17	9	10	18	24

Choose 3 :

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	9	10	**11**	**12**	**13**	**14**	**15**	**16**	17
	6	11	19	5	14	17	1	16	23	21	10	16	17	9	10	18	24

Choose 10 :

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	9	**10**	**11**	**12**	**13**	**14**	**15**	**16**	17
	6	11	19	5	14	17	1	16	23	21	10	16	17	9	10	18	24

Choose 9 :

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	17
	6	11	19	5	14	17	1	16	23	21	10	16	17	9	10	18	24

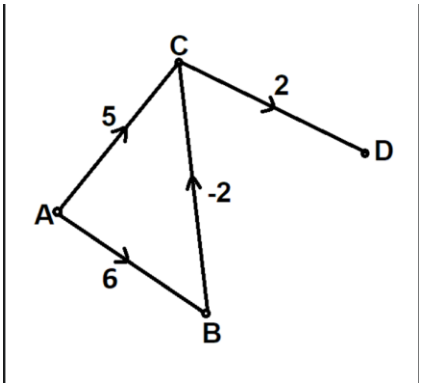
Choose 17 :

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
	6	11	19	5	14	17	1	16	23	21	10	16	17	9	10	18	24

2. **Does Dijkstra's algorithm work for negative weight edges? Why or Why not? Give an example.**

   Since Dijkstra's goal is to find the optimal path (not just any path), it, by definition, cannot work with negative weights, since it cannot find the optimal path. Dijkstra will actually not loop, since it keeps a list of nodes that it has visited. But it will not find a perfect path, but instead just any path

   Example :



Here. The shortest path from A to D is 6-2+2 = 6. But according to Dijstra's method the shortest distance will be 7 which is incorrect .

3. **Suppose we have an undirected graph with weights that can be either positive or negative. Do Prim's and Kruskal's algorithim produce a MST for such a graph?**

Yes, Because In question 2, The dijstra' algorithm is sum the edge to find each vertex. But, In MST problem there are algorithms like prims, kruskal which take only the minimum weight edge so that make the negative edge qulify for MST.

4. **Consider the problem of computing a maximum spanning tree, namely the spanning tree that maximizes the sum of edge costs. Do Prim and Kruskal's algorithm work for this problem (assuming of course that we choose the crossing edge with maximum cost)?**

Yes . Prim and Kruskal's algorithm work for the problem maximum spanning tree.