Network Flows Homework

Do problems 2 and 4 Section 8.2 using Dijkstra's Algorithm

2 Section 8.2

d(1)	P(1)	d(2)	P(2)	d(3)	P(3)	d(4)	P(4)	d(5)	P(5)
0	∅	∞	∅	∞	∅	∞	∅	∞	∅
		2	1	8	1	∞	∅	∞	∅
				7	2	6	2	14	2
				7	2			14	2
								14	2

So the shortest 1 to 5 path has length 14 and goes from 1-2-5.

4 Section 8.2

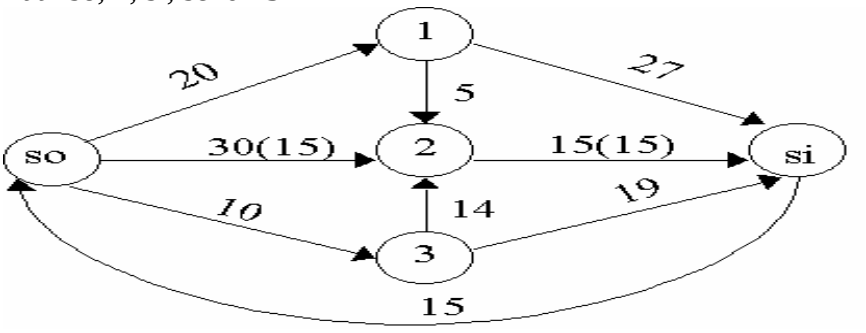
Dijkstra's solution is a tree with the following edges (1,2), (2,3), (2,4), (2,5).

d(1)	P(1)	d(2)	P(2)	d(3)	P(3)	d(4)	P(4)
0	∅	∞	∅	∞	∅	∞	∅
		2	1	1	1	∞	∅
		2	1			2	3
		2	1				

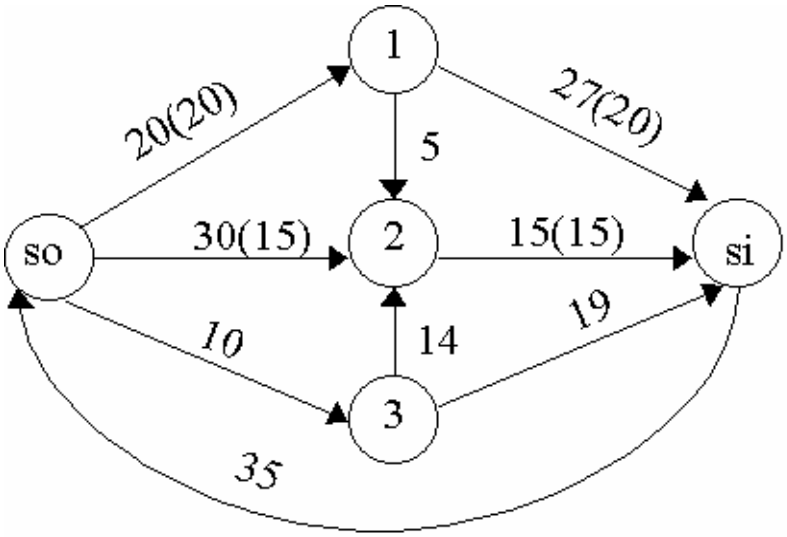
The negative weights make the algorithm choose a path to 3 that is longer than going 1 2 3.

8.3.4. Maximum flow is 45. Min Cut Set = {1, 3, and si}. Capacity of Cut Set = 20 + 15 + 10 = 45. See Figure.

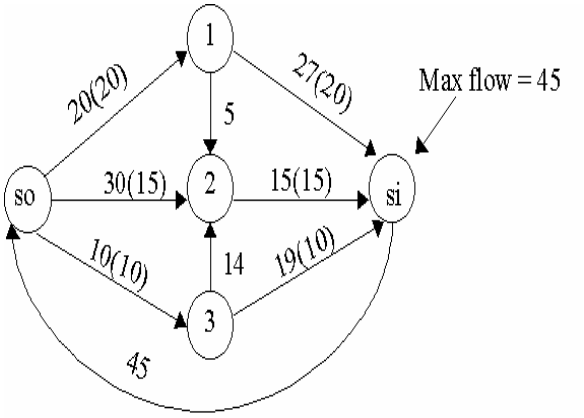
Path so, 2, si, send 15



Path so, 1, si: send 20



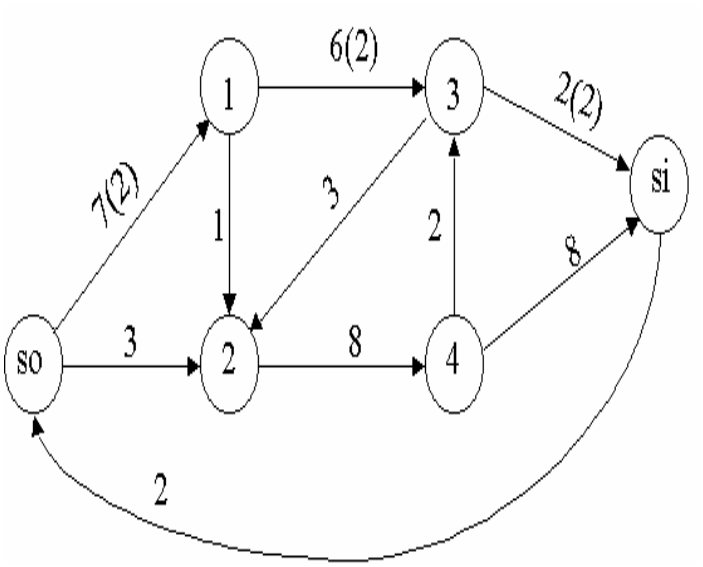
Path so, 3, si: send 10



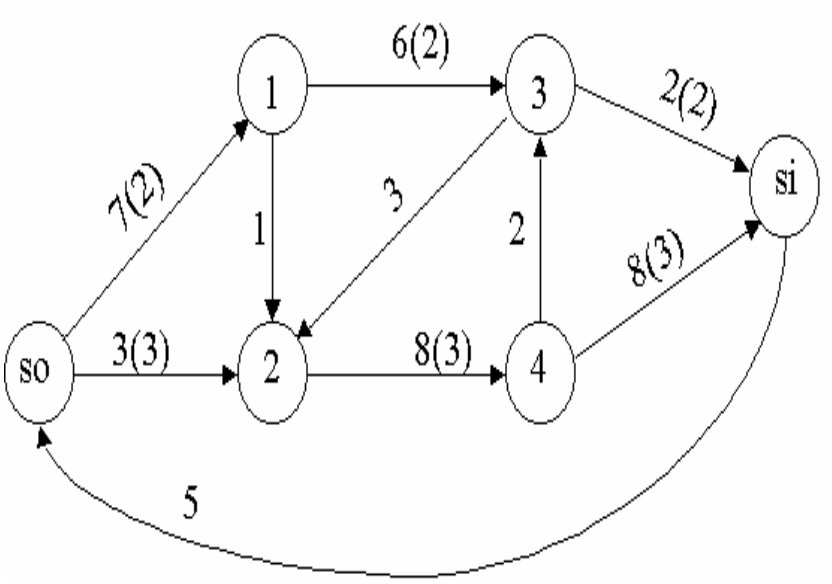
No more paths so there is a maximum flow. The bottleneck or cuts are between so and 3, 2 and si and so and 1. so and one would be better.

5. Maximum flow = 9. Min Cut Set = {2, 4, si}. Capacity of Cut = 3 + 1 + 3 + 2 = 9. See Figure.

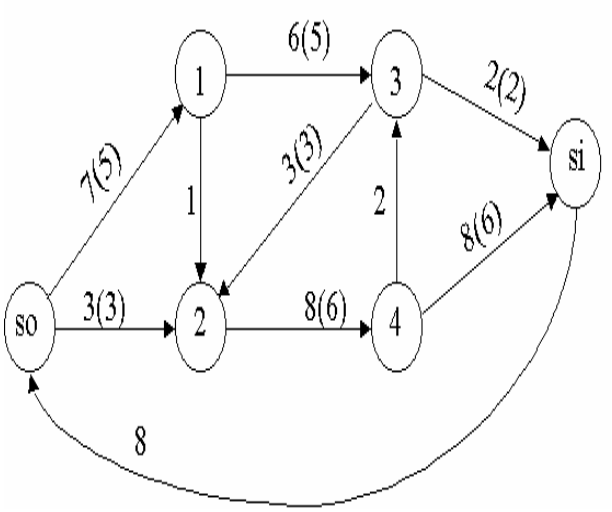
Path so, 1, 3, si: send 2



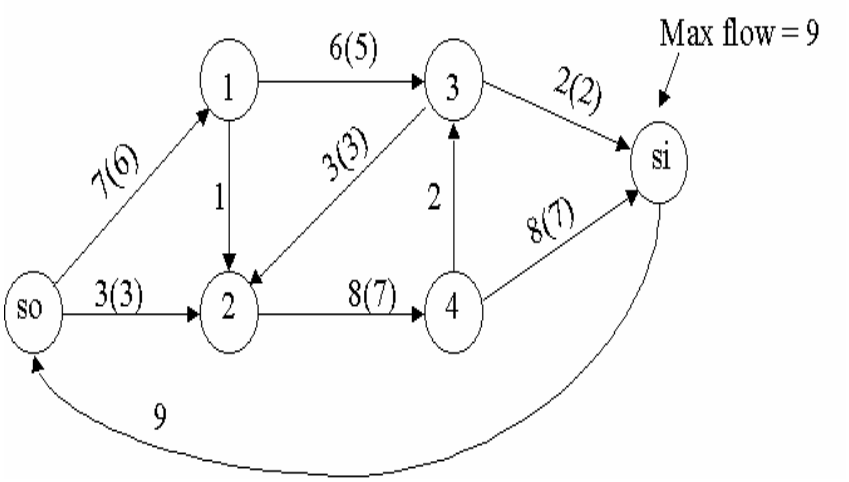
Path so, 2, 4, si: send 3



Path so, 1,3,2,4,si: send 3



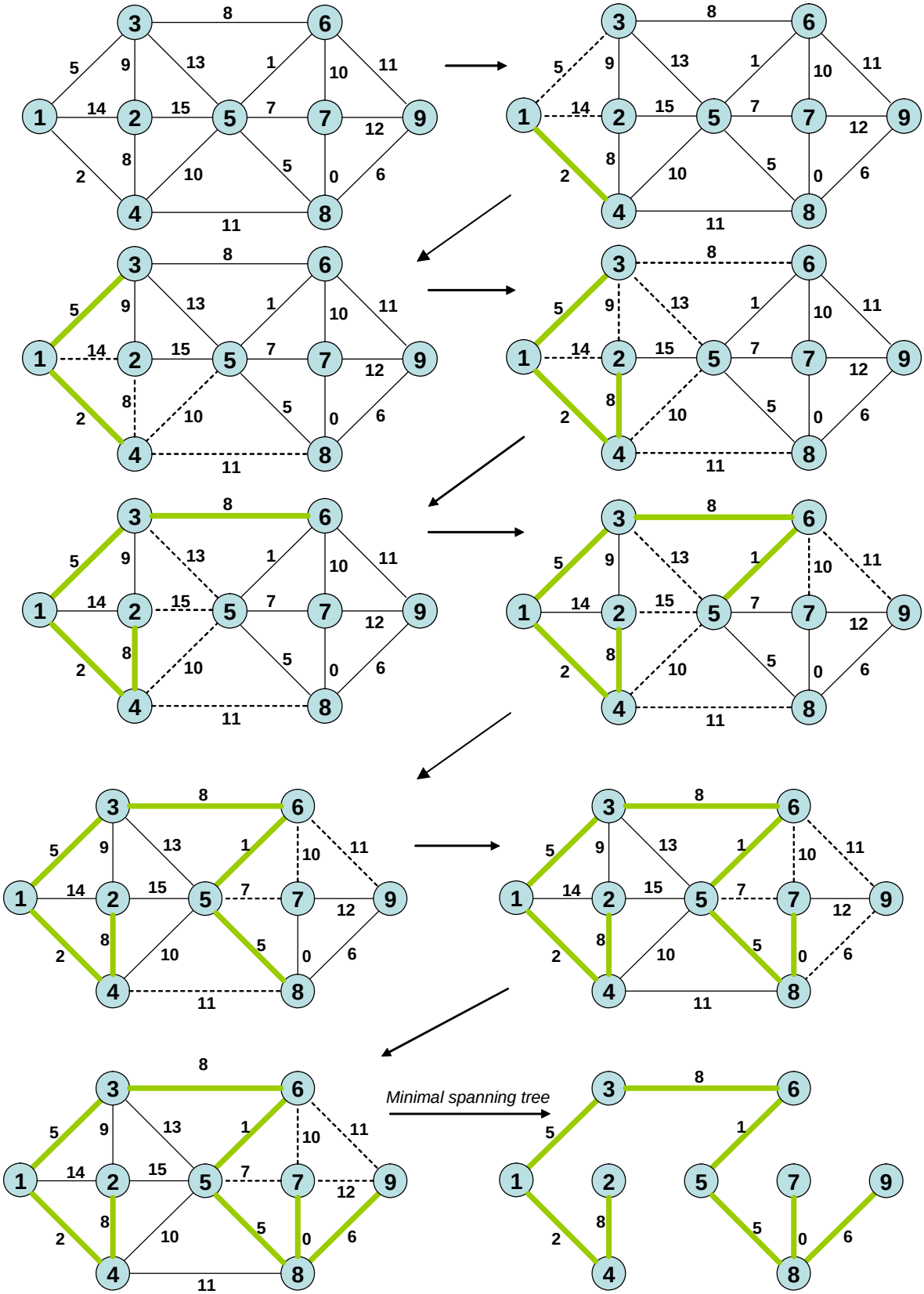
Path so,1,2,4,si: send 1



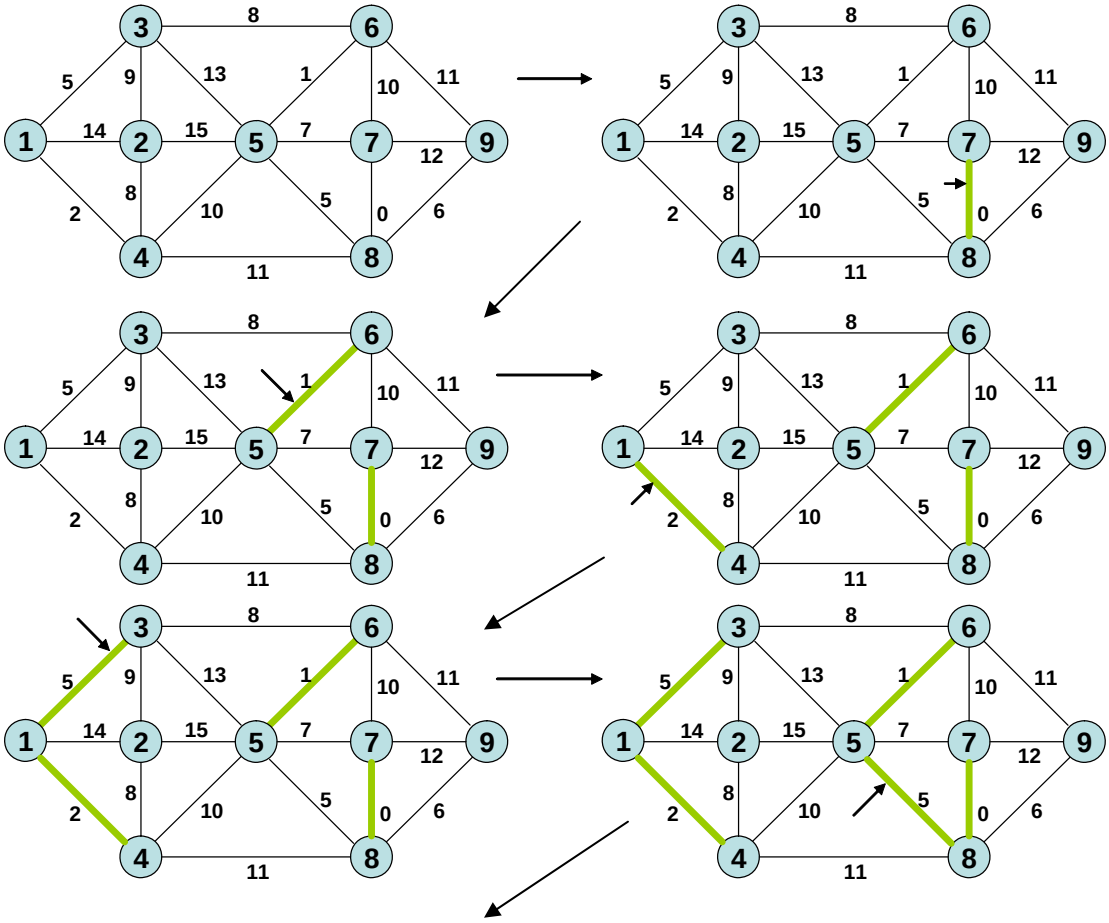
There are no more paths so there is a maximum flow. The bottleneck or cuts are between so and 2, 1 and 2, 3 and 2, 3 and si.

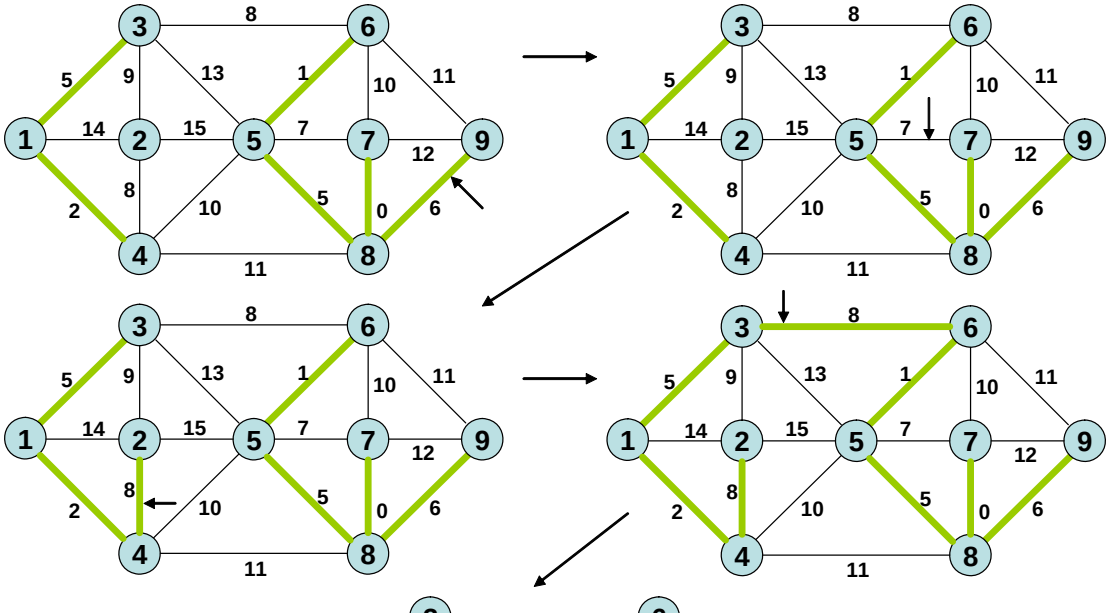
5.

Prim's Algorithm



Kruskal's Algorithm





Minimal spanning tree