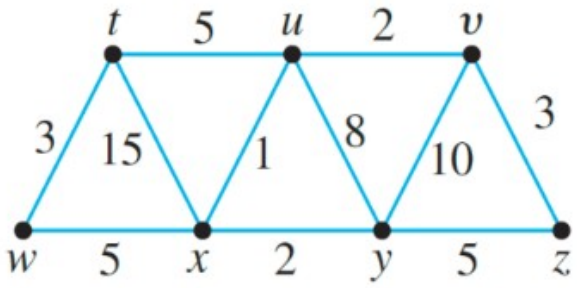
Kevin Sekuj
CS225: Discrete Math
Homework 10
Canvas problems

1)

Canvas Problem #1: Use Dijkstra's algorithm to find the shortest path from u to w in the following graph:

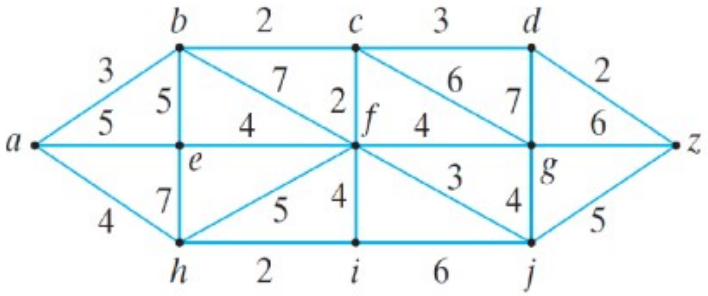


Step	S	L(t)	L(u)	L(v)	L(w)	L(x)	L(y)	L(z)
0	{}	∞	0	∞	∞	∞	∞	∞
1	{u}	5, u	0, u	2, u	∞	1, u	8, u	∞
2	{u, x}	5, (u,t)	0, u	2, (u,v)	6, (u, x , w)	1, (u, x)	3, (u,x,y)	∞
3	{u, x, v}	5, (u,t)	0, u	2, (u,v)	6, (u, x , w)	1, (u, x)	3, (u,x,y)	5, (u, v, z)
4	{u, x, v, y}	5, (u,t)	0, u	2, (u,v)	6, (u, x , w)	1, (u, x)	3, (u,x,y)	5, (u, v, z)
5	{u, x, v, y, z}	5, (u,t)	0, u	2, (u,v)	6, (u, x , w)	1, (u, x)	3, (u,x,y)	5, (u, v, z)
6	{u, x, v, y, z, t}	5, (u,t)	0, u	2, (u,v)	6, (u, x , w)	1, (u, x)	3, (u,x,y)	5, (u, v, z)

The shortest path from u → w in the following graph is u → x → w which has a distance of 6.

2)

Canvas Problem #2: Use Dijkstra's algorithm to find the shortest path from b to j in the following graph:

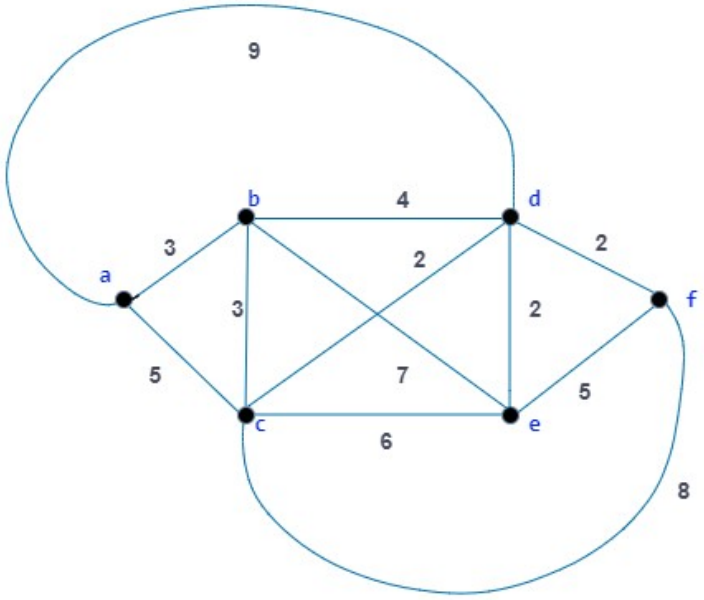


Step	S	L(a)	L(b)	L(c)	L(d)	L(e)	L(f)	L(g)	L(h)	L(i)	L(j)	L(z)
0	0	∞	0	∞	∞	∞	∞	∞	∞	∞	∞	∞
1	{b}	3, b	0,b	2,b	∞	5,b	7,b	∞	∞	∞	∞	∞
2	{b, c}	3, b	0,b	2(b,c)	5(b,c)	5,b	4(b,c)	8(b,c)	∞	∞	∞	∞
3	{b, c, a}	3(b,a)	0,b	2(b,c)	5(b,c)	5,b	4(b,c)	8(b,c)	7(b,a)	∞	∞	∞
4	{b, c, a, f}	3(b,a)	0,b	2(b,c)	5(b,c)	5,b	4(b,c,f)	8(b,c)	7(b,a)	8(b,c,f)	7(b,c,f)	∞
5	{b, c, a, f, d }	3(b,a)	0,b	2(b,c)	5(b,c, d)	5,b	4(b,c,f)	8(b,c)	7(b,a)	8(b,c,f)	7(b,c,f)	7(b,c, d)
6	{b, c, a, f, d, e}	3(b,a)	0,b	2(b,c)	5(b,c, d)	5(b, e)	4(b,c,f)	8(b,c)	7(b,a)	8(b,c,f)	7(b,c,f)	7(b,c, d)
7	{b, c, a, f, d, e, j}	3(b,a)	0,b	2(b,c)	5(b,c, d)	5(b, e)	4(b,c,f)	8(b,c)	7(b,a)	8(b,c,f)	7(b,c,f ,j)	7(b,c, d)

The shortest path from b → j in the following graph is b → c → f → j which has a distance of 7.

3)

Canvas Problem #3: Use Dijkstra's algorithm to find the shortest path from a to f in the following graph:



Step	S	L(a)	L(b)	L(c)	L(d)	L(e)	L(f)
0	{}	0	∞	∞	∞	∞	∞
1	{a}	0, a	3, a	5, a	9, d	∞	∞
2	{a, b}	0, a	3,(a,b)	5, a	9, a	10, (a,b)	∞
3	{a,b,c}	0, a	3,(a,b)	5,(a,c)	7,(a,b)	10, (a,b)	13,(a,c)
4	{a,b,c,d}	0, a	3,(a,b)	5,(a,c)	7, (a,b,d)**	9,(a,b,d)	9,(a,b,d)
5	{a,b,c,d,e}	0, a	3,(a,b)	5,(a,c)	7, (a,b,d)	9,(a,b,d,e)	9, (a,b,d)
6	{a,b,c,d,e,f}	0, a	3,(a,b)	5,(a,c)	7, (a,b,d)	9,(a,b,d,e)	9, (a,b,d,f)

Note: **7(a,c,d) is also viable, but I chose 7(a,b,d) instead as it is more straightforward.

The shortest path from a → f in the following graph is a → b → d → f which has a distance of 9.