

Sean Xia 2022/11/09 CSE310 HW3

1.A.

Step	N'	$D(t), p(t)$	$D(u), p(u)$	$D(v), p(v)$	$D(w), p(w)$	$D(y), p(y)$	$D(z), p(z)$
0	x	$\infty$	$\infty$	<u>3, x</u>	6, x	6, x	8, x
1	xv	7, v	<u>6, v</u>		6, x	6, x	8, x
2	xvu	7, v			<u>6, x</u>	6, x	8, x
3	xvu w	7, w				<u>6, x</u>	8, x
4	xvu w	<u>7, w</u>					8, x
5	xvu w t						<u>8, x</u>
6	xvu w t z						

so shortest paths are:  $D(t)=7, D(u)=6, D(v)=3, D(w)=6, D(y)=6, D(z)=8$ .

1.B.

Step	N'	$D(u), p(u)$	$D(v), p(v)$	$D(w), p(w)$	$D(x), p(x)$	$D(y), p(y)$	$D(z), p(z)$
0	t	<u>3, t</u>	$\infty$	$\infty$	$\infty$	7, t	$\infty$
1	t v		<u>4, t</u>	5, v	$\infty$	7, t	$\infty$
2	t u v			<u>5, v</u>	7, v	7, t	$\infty$
3	t u v w				<u>7, v</u>	7, t	$\infty$
4	t u v w x					<u>7, t</u>	15, x
5	t u v w x y						<u>15, x</u>
6	t u v w x y z						

so shortest paths are:  $D(u)=3, D(v)=4, D(w)=5, D(x)=7, D(y)=7, D(z)=15$

2.  $A_{x,y}=3, c_{y,z}=6, c_{z,x}=4$  Equation:  $D_x(y) \leftarrow \min_v \{c_{x,v} + D_v(y)\}$

Node x

	x	y	z
x	0	3	4
y	$\infty$	0	$\infty$
z	$\infty$	$\infty$	0

	x	y	z
x	0	3	4
y	3	0	6
z	4	6	0

Because the values did not change between  $t=1$  and  $t=2$ , we know that these values will not change on the next iteration, because we would just do the same calculations because of the same numbers, some will not continue doing more iterations.

Since

Node y

	x	y	z
x	$\infty$	0	$\infty$
y	3	0	6
z	$\infty$	$\infty$	0

	x	y	z
x	0	3	4
y	3	0	6
z	4	6	0

Node z

	x	y	z
x	$\infty$	$\infty$	0
y	$\infty$	$\infty$	0
z	4	6	0

	x	y	z
x	0	3	4
y	3	0	6
z	4	6	0

t=1

t=2

time



2.6  $c_{uv}=1, c_{vu}=2, c_{vx}=3, c_{vz}=6, c_{xz}=3, c_{xz}=2$  Equation:  $D(x,y) = \min_v \{c_{xv} + D(v,y)\}$

Node u

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

Node v

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

Node x

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

Node y

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

Node z

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

t=1

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

t=2

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

t=3

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

	u	v	x	y	z
u	0	1	4	2	6
v	1	0	3	3	5
x	4	3	0	3	2
y	2	3	3	0	5
z	6	5	2	5	0

t=4

Because the values did not change between  $t=3$  and  $t=4$ , we know that these values will not change on the next iteration, because we would just do the same calculations because of the same numbers. So we will not continue doing more iterations.

Distance table entries at node z for each iteration.

u, x, z really only things that matter since only things connected to z.