I have read and understood the course academic integrity policy

1)

1) **Dijkstra's algorithm** – Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from *x* to all network nodes. Show how the algorithm works by computing a table similar to Table 5.1. **(30 points)**

Step	N'	$D(z), P(z)$	$D(y), P(y)$	$D(v), P(v)$	$D(w), P(w)$	$D(t), P(t)$	$D(u), P(u)$
0	x	8, x	6, x	3, x	6, x	∞	∞
1	xv	8, x	6, x		6, x	7, v	6, v
2	xvy	8, x			6, x	7, v	6, v
3	xvyw	8, x				7, v	6, v
4	xvywu	8, x				7, v	
5	xvywut	8, x					
6	xvywutz						

2) **Distance vector algorithm** – Consider the network below:

a) What are A, B, C, D, E, and F's distance vectors? Note: you do not have to run the distance vector algorithm; you should be able to compute the distance vectors by inspection. Recall that a node's distance vector is the vector of the least cost paths from itself to each of the other nodes in the network. **(8 points)**

b) Now consider node C. From which other nodes does C receive distance vectors? **(8 points)**

c) Consider node C again. Through which neighbor will C route its packets destined to E? Explain how you arrived at your answer, given the distance vectors that C has received from its neighbors. **(8 points)**

d) Consider node E. From which other nodes does E receive distance vectors? **(8 points)**

e) Consider node E again. Through which neighbor will E route its packets destined to B? Explain how you arrived at your answer, given the distance vectors that E has received from its neighbors. **(8 points)**

2)A)

$D_A(A) = 0$
$D_A(B) = 2$
$D_A(C) = 2$
$D_A(D) = 3$
$D_A(E) = 7$
$D_A(F) = 6$

$D_B(A) = 2$
$D_B(B) = 0$
$D_B(C) = 4$
$D_B(D) = 5$
$D_B(E) = 6$
$D_B(F) = 4$

$D_C(A) = 2$
$D_C(B) = 4$
$D_C(C) = 0$
$D_C(D) = 1$
$D_C(E) = 5$
$D_C(F) = 7$

$D_D(A) = 3$
$D_D(B) = 5$
$D_D(C) = 1$
$D_D(D) = 0$
$D_D(E) = 4$
$D_D(F) = 6$

$D_E(A) = 7$
$D_E(B) = 6$
$D_E(C) = 5$
$D_E(D) = 4$
$D_E(E) = 0$
$D_E(F) = 2$

$D_F(A) = 6$
$D_F(B) = 4$
$D_F(C) = 7$
$D_F(D) = 6$
$D_F(E) = 2$
$D_F(F) = 0$

b). node A B D

c). node D

$$D_C(E) = \min\{C_{CA} + D_A(E),\ C_{CB} + D_B(E),\ C_{CD} + D_D(E)\}$$

$$= \min\{2+7,\ 8+6,\ 1+4\}$$

$D_C(E) = 5 \leftarrow C_{CD} + D_D(E)$

received from node D has minum cost

$D_A(E) = 7$

$D_B(E) = 6$

$D_D(E) = 4$

d. node B D F

e. node F

$$D_E(B) = \min\{C_{EB} + D_B(B),\ C_{EF} + D_F(B),\ C_{ED} + D_D(B)\}$$

$$= \min\{10+0,\ 2+4,\ 4+5\}$$

$D_E(B) = 6 \leftarrow C_{EF} + D_F(B)$

received from node F has minum cost

$D_B(B) = 0$

$D_F(B) = 4$

$D_D(B) = 5$

3) **BGP** – Consider the network below in which network W is a customer of ISP A, network Y is a customer of ISP B, and network X is a customer of both ISPs A and C.

a) What BGP routes will A advertise to X? **(10 points)**
b) What routes will X advertise to A? **(10 points)**
c) What routes will A advertise to C? **(10 points)**

For each answer, provide a one-sentence explanation.

a) According to the BGP routing policy:
First: A will advertise routes AW,and ABY.
Because: A will advertise routes learned from its customer, W, and from its other ISP B to customer X.

b)
Advertise routes AX.
because customer have to advertise his own prefixes routes, and does not want to carry transit traffic between other ISP.

c)
Advertise routes AW,AX because provider have to advertise the routes between him and his customer to others provider.

Bonus:

a) We can record the identification number on each packet, because of the identification numbers of subsequent IP packets are sequentially assigned, it is possible to count the number of hosts behind a NAT. We can count the number of the gaps between the successive identification number. The number of gaps (or the number of successive identification number group) represent the number of hosts behind NAT.
b) If the identification number is assigned randomly, we can not use the successive identification number to estimate number of hosts. Because the identification number from one host can be separate randomly, it is not possible to count the host number by simply analysis identification number