Final Exam

1. [1] T
   [2] T
   [3] F
   [4] T
   [5] F
   [6] F
   [7] F
   [8] F
   [9] F
   [10] T

2.

1) Interface 0: `00_____`, i.e., from `00000000` to `00111111`;
   Interface 1: `010_____`, i.e., from `01000000` to `01011111`;
   Interface 2: `011_____` and `10_____`, i.e., from `01100000` to `10111111`;
   Interface 3: `11_____`, i.e., from `11000000` to `11111111`.

2) a. The devices at the rightmost position in the figure have addresses `192.168.1.1`, `192.168.1.2`, and `192.168.1.3`. And the gateway of the router to the home network is `192.168.1.4`.

   b.

WAN side	LAN side
`24.34.112.235, 5001`	`192.168.1.1, 3345`
`24.34.112.235, 5002`	`192.168.1.1, 3346`
`24.34.112.235, 5003`	`192.168.1.2, 3345`
`24.34.112.235, 5004`	`192.168.1.2, 3346`
`24.34.112.235, 5005`	`192.168.1.3, 3345`
`24.34.112.235, 5006`	`192.168.1.3, 3346`

3) a)

0	x	6,x	7,x	4,x	∞	∞	∞
1	xw	6,x	1,w		∞	5,w	∞
2	xwv	6,x			6,v	5,w	∞
3	xwvu	6,x			3,u		∞
4	xwvuz	2,z					8,z
5	xwvuzy						4,y
6	xwvuzyt						

b) The tree consists of two paths: x–w–v, x–w–u–z–y–t from a). Thus, from x, every entry is to w.

c) Internet may propagate wrong link during its update.

4) a) Since 3c learns about prefix x from the router 4c, the routing protocol corresponding to it is eBGP.

b) Since 1d learns about prefix x from a router in AS1, the routing protocol corresponding to it is RIP.

c) The signal will be transmitted from AS4—AS3—1c—1a—1d, so l will be equal to l1.

d) Since 1c—1a—1d yields more intra-network cost than 1b—1d, via hot potato routing, l will be set to l2.

5) SDN, software defined network, is the network whose controller computes forwarding tables and interacts with routers is implemented in a software. Other key characteristics of SDN include flow-based forwarding, separation of data plane and control plane, and programmability.

6) One of the attributes of the knowledge plane (KP) is edge involvement, which means KP reaches more broadly than the end-to-end principle. Besides that, KP can extend itself to the whole global world ideally. Also, multiple KP's can make a composition.

7) a) 6 nodes are lined up on a straight line with the gap of 35 m between two adjacent nodes.

b) Nodes 1, 2, 4, 5 had changes in their routing tables.

Node	One-hop connections
Node 0	[Node 1]
Node 1	[Node 0, Node 2, Node 4]
Node 2	[Node 1, Node 3, Node 4]
Node 3	[Node 2, Node 4]
Node 4	[Node 1, Node 2, Node 3]
Node 5	[]

c) Node 0 and node 6.

3·

1) a) No, because Host E can know that Host F is in the same LAN as host E by checking the subnet mask. Thus,

- source IP: IP of Host E
- dest'n IP: IP of Host F
- source MAC address: MAC address of Host E
- dest'n MAC address: MAC address of Host F

b) No, because Host E does not use MAC address of Host B and it sends an IP datagram to the router R1. In this case,

- source IP: IP of Host E
- dest'n IP: IP of Host B
- source MAC address: MAC address of Host E
- dest'n MAC address: MAC address of R1

c) Since the message is a broadcast message, S1 will broadcast the ARP request message through both links to Subnet 1 and Subnet 2. Therefore, R1 will receive the ARP request message. However, it will not be forwarded to Subnet 3.

Host B will not send an ARP query message to ask for A's MAC address, because Host B already knows the MAC address of Host A from the query message that Host A had sent.

S1 will add Host A in the forwarding table, and it will drop the frame because Host B and Host A are in the same subnetwork.

2)

3) From EE side, the datagram is sent to the router. The router checks the VLAN ID and it transmits to the CS side and the CS host receives the datagram.

4.

1) CSMA/CA is introduced instead.

2) The time required to send a frame without data is $T_0 = 256$ bits / 11 Mbps = 23.273 microseconds, and the time required to send a frame with data is $T_1 = (8000 + 256)$ bits / 11 Mbps = 750.545 microseconds. Therefore, the total time required is $DIFS + T_0 + SIFS + T_0 + SIFS + T_1 + SIFS + T_0 = DIFS + 3 \times SIFS + 820.364\,\mu s$.

3) a. Attacks that steals the message during its transition can be blocked, such as man-in-the-middle.
b. Public key is open to all, but shared key is shared with two parties sending and receiving messages.

5.

Discussion and Suggestion Thank you for the entire class.