TODO: 2b, 3d, 5

1. **Determine the range of IP addresses that is represented by the following CIDR IPv4 addresses.**

a) 192.168.0.0/16
The range of IP addresses in this subnet is from
11000000.10101000.00000000.00000000 = 192.168.0.0
to
11000000.10101000.11111111.11111111= 192.168.255.255

b) 192.168.128.0/17
The range of IP addresses in this subnet is from
11000000.10101000.10000000.00000000 = 192.168.128.0
to
11000000.10101000.11111111.11111111 = 192.168.255.255

c) 192.168.128.0/18
The range of IP addresses in this subnet is from
11000000.10101000.1000000.0000000 = 192.168.128.0
to
11000000.10101000.10111111.11111111 = 192.168.191.255

d) 192.168.128.0/8
The range of IP addresses in this subnet is from
11000000.10101000.10000000.00000000 = 192.168.128.0
to
11000000.11111111.11111111.11111111 = 192.255.255.255

2. **Determine the network ID and host ID for the following CIDR IPv4 addresses.**

a) IP address: 192.168.0.64, Address mask: 255.255.0.0
Network ID = 192.168.0.0
Host ID = 0.0.0.64

b) IP address: 27.78.101.154 - , Address mask: 255.255.255.224
Network ID = 27.78.101.128
Host ID = 0.0.0.26

c) IP address: 172.134.56.34, Address mask: 255.255.128.0
Network ID = 172.134.0.0
00111000
AND
10000000
00000000
Host ID = 0.0.56.34

d) IP address: 192.168.0.23, Address mask: 255.192.0.0
Network ID = 192.128.0.0
Host ID = 0.0.0.23
10101000 = 168
AND

11000000 = 192
10000000 = 128

3. **Suggest a way to divide the network 10.128.192.0/25 into three subnets of which one subnet should be able to hold 60 hosts and the other two subnets should be able to contain 30 hosts.**
2^n-2 >= 60, n = 6
32 - 26 = 6 10.128.192.0/26
From
00001010.10000000.11000000.00000000 = 10.128.192.0
to
00001010.10000000.11000000.00111111 = 10.128.192.63

2^n-2 >= 30, n = 5
32 - 27 = 5 10.128.192.64/27
From
00001010.10000000.11000000.01000000 = 10.128.192.64
to
00001010.10000000.11000000.01011111 = 10.128.192.95

2^n-2 >= 30, n = 5
32 - 27 = 5 10.128.192.96/27
From
00001010.10000000.11000000.01100000 = 10.128.192.96
to
00001010.10000000.11000000.01111111 = 10.128.192.127

4. **The forwarding table of a router is shown below. Determine the next hop for packets received by the router with the destination IP-addresses as follows:**

Destination	Mask	Next hop
128.96.39.0	255.255.255.128	A
128.96.128.0	255.255.128.0	B
128.96.192.0	255.255.192.0	C
default		D

a) 128.96.126.34 = 10000000.01100000.01111110.00100010
NEXT HOP = DEFAULT
11111111.11111111.11111111.10000000 = MASK A
11111111.11111111.11000000.00000000 = MASK C
11111111.11111111.10000000.00000000 = MASK B
AND
10000000.01100000.01111110.00100010
=
10000000.01100000.01000000.00000000 = 128.96.64.0 C
10000000.01100000.00000000.00000000 = 128.96.0.0 B

b) 128.96.130.45 = 10000000.01100000.10000010.00101101
NEXT HOP = B
11111111.11111111.11111111.10000000 = MASK A
11111111.11111111.10000000.00000000 = MASK B
11111111.11111111.11000000.00000000 = MASK C
AND
10000000.01100000.10000010.00101101
=
10000000.01100000.10000010.00000000 = 128.96.130.0 A
10000000.01100000.10000000.00000000 = 128.96.128.0 B
10000000.01100000.10000000.00000000 = 128.96.128.0 C

c) 128.96.190.23 = 10000000.01100000.10111110.00010111
NEXT HOP = B
11111111.11111111.11111111.10000000 = MASK A
11111111.11111111.10000000.00000000 = MASK B
11111111.11111111.11000000.00000000 = MASK C
AND
10000000.01100000.10111110.00010111
=
10000000.01100000.10111110.00000000 = 128.96.190.0 A
10000000.01100000.10000000.00000000 = 128.96.128.0 B
10000000.01100000.10000000.00000000 = 128.96.128.0 C

d) 128.96.200.67 = 10000000.01100000.11001000.01000011
NEXT HOP = B
11111111.11111111.11111111.10000000 = MASK A
11111111.11111111.10000000.00000000 = MASK B
11111111.11111111.11000000.00000000 = MASK C
AND
10000000.01100000.11001000.01000011
=
10000000.01100000.11001000.00000000 = 128.96.200.0 A

10000000.01100000.10000000.00000000 = 128.96.128.0 B
10000000.01100000.10000000.00000000 = 128.96.128.0 C

e) 128.97.0.12 = 10000000.01100001.00000000.00001100
NEXT HOP = DEFAULT
11111111.11111111.11111111.10000000 = MASK A
11111111.11111111.10000000.00000000 = MASK B
11111111.11111111.11000000.00000000 = MASK C
AND
10000000.01100001.00000000.00001100
=
10000000.01100001.00000000.00001100 = 128.97.0.12 A
10000000.01100001.00000000.00001100 = 128.97.0.12 B
10000000.01100001.00000000.00001100 = 128.97.0.12 C

5. **Consider a router, D, with three adjacent routers, A, B, and C. Router D uses distance vector routing and has the routing table depicted below. The table shows the shortest paths from the router to its known networks. For example, the shortest path from router D to a host on network 2 is six hops.**

Destination	Number of Hops	Router
Network 2	6	A
Network 3	4	C
Network 4	3	A
Network 5	2	C
Network 6	3	B

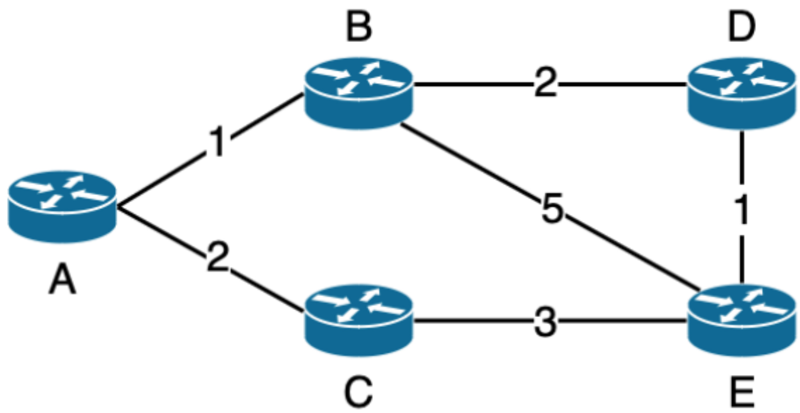
The router receives the advertisement shown below from router C. Determine the routing table after it has been updated.

Destination	Number of Hops
Network 2	6
Network 3	4
Network 4	1
Network 5	2
Network 6	3

Updated table:

Destination	Number of Hops	Router
Network 2	6	A
Network 3	4	C
Network 4	1	C
Network 5	2	C
Network 6	3	B

6. **Use Dijkstra's shortest path first algorithm to determine the least cost path from router A to the other routers in the network depicted below. Show your solution in a table such as Table 5.1 in the textbook. Also show the resulting shortest path graph.**



Step	N'	D(b),p(b)	D(d),p(d)	D(c),p(c)	D(e),p(e)	
0	A	1, A	INF	2, A	INF	
1	AB	1, A	3, B		6, B	
2	ABC				5, C	
3	ABCD				4, D	
4	ABCDE		3, B	2, A		
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