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Name:- Md. Shariyar Akbar

ID:- 22201232

Section:- 23

Course :- CSE421

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Question - 1 (a)

i. IPv4 address = 19.96.99.49 | Prefix mask = 10

∴ if /10 = 11111111 , 11000000.00000000.000000

(in binary)

IPv4 (in binary) = 00010011.01100000.01100011.0011000

Thus,

network address = 00010011.01000000.00000000

00000000

= 19.64.0.6

ii. Subnet mask is /10

∴ 255.192.0.0

iii. Number of host = $(2^{32-10}) - 2$

$= 2^{22} - 2$

= 4194302 host

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b) The network address : 19.64.0.0/10

for,

1. S_TWO → 2^{10} (1024) address, Subnet : 19.64.0.0/22
2. S_ONE → 2^8 (256) " " : 19.64.4.0/24
3. WAN Links → Each one will need /30
   - i. R1 to R3 = 19.64.5.4/30
   - ii. R1 to S_Three = 19.64.5.4/30
   - iii. S_Three to R2 : 19.64.5.8/30
   - iv. R2 to R3 : 19.64.5.12/30

Q.2 a) The origin devices stops when it receives an ICMP Port unreachable message (if using UDP) or an ICMP Echo Reply (if using ICMP Echo) from the destination, indicating the packet finally reached the ~~final~~ target instead of a router.

b) It is calculated by taking the number of bytes from the start of the original payload and dividing by 8. The value indicates the position of the fragment relative to the start of the original

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Unfragmented IP datagram.

c) The server has a private IP (192.168.10.10). outside users can't access it because the router lacks Port forwarding to map the public IP (210.21.21.10) to the server's internal address.

d) (i) The Problem is the DHCP pool network (200.20.21.0) is on different subnet than the interface fa0/0 (200.21.21.253) and the default router (200.21.21.254).

Solution: Change the pool network to 200.21.21.0 255.255.255.0

(ii) DHCP Lease Early Release, the client should send a DECPRELEASE message to the server to inform it that the IP address is no longer needed.

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Q3 a) Distance vector algorithms do not keep track of their neighbors to detect if a route has become unreachable. If no updates are received, the route is considered down.

b) ~~The Link state algo~~ The Link state algorithm reduces the unnecessary traffic because routers only send updates when there is a change in the network topology, unlike Distance vector algorithms, which continuously send updates. Link-state algorithms also avoid routing loops and ensure faster convergence.

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c) $D_z(x) = \min [c(z,w) + D_w(x), c(z,y) + D_y(x)]$

$w \rightarrow 1+2 = 3$

$y \rightarrow 7+1 = 8$

$D_z(x) = 3$ (through w)

Table for z router (updates once):

	w	y	cost	next hop
x	3	8	3	w
y	8	7	7	y
z				
w	1	13	1	w
v	6	4	6	w
m	7	7	7	w/y

for x

w : $c(z,w) + D_w(x) = 1+2 = 3$

y : $c(z,y) + D_y(x) = 7+1 = 8$

Decision : $\min(3,8) = 3$

(next hop w)

for v

w : $c(z,w) + D_w(v) = 1+5 = 6$

y : $c(z,y) + D_y(v) = 7+4 = 11$

Decision : $\min(6,11) = 6$

(next hop w)

for m

w : $c(z,w) + D_w(m) = 1+6 = 7$

y : $c(z,y) + D_y(m) = 7+0 = 7$

$\min(7,7) = 7$ (next hop : w or y)

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Q4

a) 1. Static Routes:

R1: ip route 0.0.0.0 0.0.0.0 192.168.10.2

R2: ip route 0.0.0.0 0.0.0.0 10.10.10.1

~~Floating Static Routes~~

II To create floating state routes, we have to add an Administrative Distance (AD) higher than the primary route.

b) AD1 represents the trustworthiness of a static route. Cost 0 is used because static routes don't have a dynamic metric. And the AD is not always 1. It can be changed

c) The networks 192.168.2.0/26, 64/26, 128/26 and 192/26 cover the entire 192.168.2.0/24 range. If R1 summarizes these to /24, it works. However, if any subnets in the range exist elsewhere, it causes suboptimal routing. Thus, we have to ensure the summarized

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block is contiguous and exclusively located behind the summarized interface.

Q5.

~~a) IPv4 and IPv6 are not compatible~~

a) Yes, IPv4 and IPv6 are not compatible. An IPv6 - only network (india) cannot natively route IPv4 packets. Thus, if Tunneling or NAT64 is used the problem can be solved. Tunneling is basically encapsulating IPv4 packets inside IPv6 and NAT64 means translation between the two protocols.

b) FF10::AC19:0:1000:2000

(Removing leading zeroes by using "::")

c) MAC: F0-B2-F0-EA-DF-35.

By flipping 7th bit: F2B2:F0FF:FEEA:DF35

Subnet ID 0010. (Assuming Global Prefix 2001:db8:1B2.

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Thus, the full address : 2001:db8::10:F2B2:F0FF:FBEA:DF35

d)(i) False, Because in stateless DHCPV6, the device uses SLAAC for the IP & the DHCPV6 server is only for additional information like DNS.

(ii) The device uses Duplicate Address Detection (DAD) by sending a Neighbor ~~Solicat~~ solicitation message for its own address to see if anyone responds.

6) a) No, ARP is a broadcast protocol that does not cross router boundaries. You only get the MAC of your default gateway to reach the other network.

b)(i) Initially, all tables are Empty.

(ii) S1 will contain entries for Host A (on port fo/0) and Host D (learned via the port connected to S2/S3).

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c) (i) EE ends in an even number (bit 0 is 0), so it is unicast.

(ii) The first three bytes: EE:A9:B8

(iii) Changing the 2nd least significant bit of the first byte (the "U/L" bit)

d) NIC means Network Interface Card. It is a hardware component which is often integrated into the motherboard or inserted as PCIe expansion card, that serves as the essential bridge between a computer and a network. IP operates at both the Physical and Data link layers of the OSI model, converting internal digital data into electrical or radio signal for transmission. Each NIC is uniquely identified by hardcoded MAC address which allows is to manage data framing framing and ensure that packets reach the

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Correct physical destination on a local network.