

Q.1 @ Network address: 10

Subnet Mask:  $11111111 \cdot 11000000 \cdot 00000000 \cdot 00000000$

IP Address:  $00010011 \cdot 01100000 \cdot 01100011 \cdot 00110001$

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$\Rightarrow 10 \cdot 64 \cdot 0 \cdot 0$

(i) So network address:  $10.64.0.0$

(ii) subnet mask:  $255.192.0.0$

(iii) hosts:  $2^8 - 2 = 254$

Q1(b)

10.64.0.1	10.64.0.2	10.64.0.3	10.64.0.4	10.64.0.5
10.64.0.6	10.64.0.7	10.64.0.8	10.64.0.9	10.64.0.10
10.64.0.11	10.64.0.12	10.64.0.13	10.64.0.14	10.64.0.15
10.64.0.16	10.64.0.17	10.64.0.18	10.64.0.19	10.64.0.20
10.64.0.21	10.64.0.22	10.64.0.23	10.64.0.24	10.64.0.25
10.64.0.26	10.64.0.27	10.64.0.28	10.64.0.29	10.64.0.30
10.64.0.31	10.64.0.32	10.64.0.33	10.64.0.34	10.64.0.35

Network address:  $10.64.0.0$

S-ONE = 254 hosts  
S-TWO = 600 hosts  
S-Three = LAN  
= 3 routers

R1-R3 - P2P Link

R2-R3 - P2P Link

for S-ONE :- Address  $\geq 254$

$$2^8 - 2 = 254$$

Prefix = /29

Mask =  $255.255.255.0$

for S-TWO :- Address  $\leq 600$

$$\therefore 2^{10} - 2 = 1022$$

Prefix = /22

Mask = 255. 255. 252. 0

S-Three  $\Rightarrow 2^3 - 2 = 6$

Prefix = /29

Mask = 255. 255. 255. 248

P2P :-

$2^2 - 2 = 2$

Prefix : /30

Masks : 255. 255. 255. 252

	S-ONE	S-TWO	S-Three	R1-R3	R2-R3
Network	19.64.4.0/22	19.64.0.0/22	19.64.5.0/29	19.64.5.8/30	19.64.3.12/30
Usable	19.64.4.1 - 19.64.4.254	19.64.0.1 - 19.64.3.254	19.64.5.1 - 19.64.5.6	19.64.5.9 - 19.64.5.10	19.64.5.13 19.64.5.14
Broadcast	19.64.4.255	19.64.3.255	19.64.5.7	19.64.5.11	19.64.5.15

Q.2  
①

Sends probes with TTL = 1, 2, 3 ...

↓  
each router decrements TTL

↓  
TTL = 0, ICMP Time exceeded

↓  
Sends ICMP echo reply

↓  
Origin detects final destination response

↓  
Stops increasing TTL

(b) indicates position of fragment = fragment offset

Formula: Starting byte/8

→ first fragment offset = 0

→ used with MF flag

→ required for reassembly

(c) Private IPs not routable on Internet, Single public IP (210.21.21.0) were no NAT/Port forwarding configured. So Router blocks inbound requests.

#### (d) Problems:

i. Wrong DHCP network statement

ii. network mismatch

iii. DHCP pool doesn't match interface subnet

iv. DNS server inside excluded range

#### Solutions:

⇒ correct DHCP

⇒ fix excluded - address order

(e) DHCP release message; so DHCP server knows you left early

⇒ Client send release

⇒ Server frees IP immediately

⇒ if no release: \* lease timer expired

\* no renewed ( $T_1, T_2$ )

Q3

- a) Distance Vector does not keep track of neighbors because it doesn't have any topological knowledge. It has only next hop distance.

It knows about networks like:

⇒ periodic updates

⇒ Timeout

⇒ infinity metric

if no update → neighbor is down

- b) Link state has triggered updates, not periodic, no count

to infinity, controlled flooding

$$D_z(v) = \min \{ c(z, w) + D_w(v), c(z, s) + D_s(v) \}$$

Q4

- a) ① ip route 0.0.0.0 0.0.0.0 <next-hop>

- ② ip route 0.0.0.0 0.0.0.0 <next-hop> 200

- (b) Lower AD = higher priority so static route preferred  
 Hint: No, AD not always 1. can't be manually changed.

Additional notes

Solution:

→ Add Null0 route

→ Proper summarization

→ Longest prefix match

(c) Problem:

- (i) Black hole routing
- (ii) Traffic dropped
- (iii) Missing specific routes

Q5

- (a) Yes this will cause issue, IPv4 and IPv6 incompatible

Solution:

(i) Dual Stack

(ii) Tunneling

(iii) NAT Transformation

(b)

FF10 :: AC19:0:1000: E000

(c)

F2B2 : F0FF : FEEA : DF35 : Short

- (d) (i) False. SLAAC assigns IP ; DHCP gives DNS

(ii) SLAAC's uniqueness :

(i) neighbor solicitation

(ii) ICMPv6

(iii) N.- reply - address valid

Q6  
①

No. ARP is broadcast and Routers block broadcast.

②

i) No learned MACs so empty tables

ii)

MAC	Port
A	F0/1
D	F0/0

③

i) It is a Unicast

ii) OUI

iii) Locally administered

④

NIC : Network Interface Card

If is located in:-

i) Hardware component

ii) Inside host device

iii) Enables network access.