

Spring 25

Set - B

Ques. No. - 01

I

Given,

$$\text{IPv4 address} = \frac{3}{n} \cdot \frac{12}{n} \cdot \frac{66}{3+h} \cdot \frac{26}{h} / 19$$

$\downarrow \quad \quad \downarrow$
 $n \quad \quad h$

$$66 = \frac{010}{n} \cdot \frac{00010}{h}$$

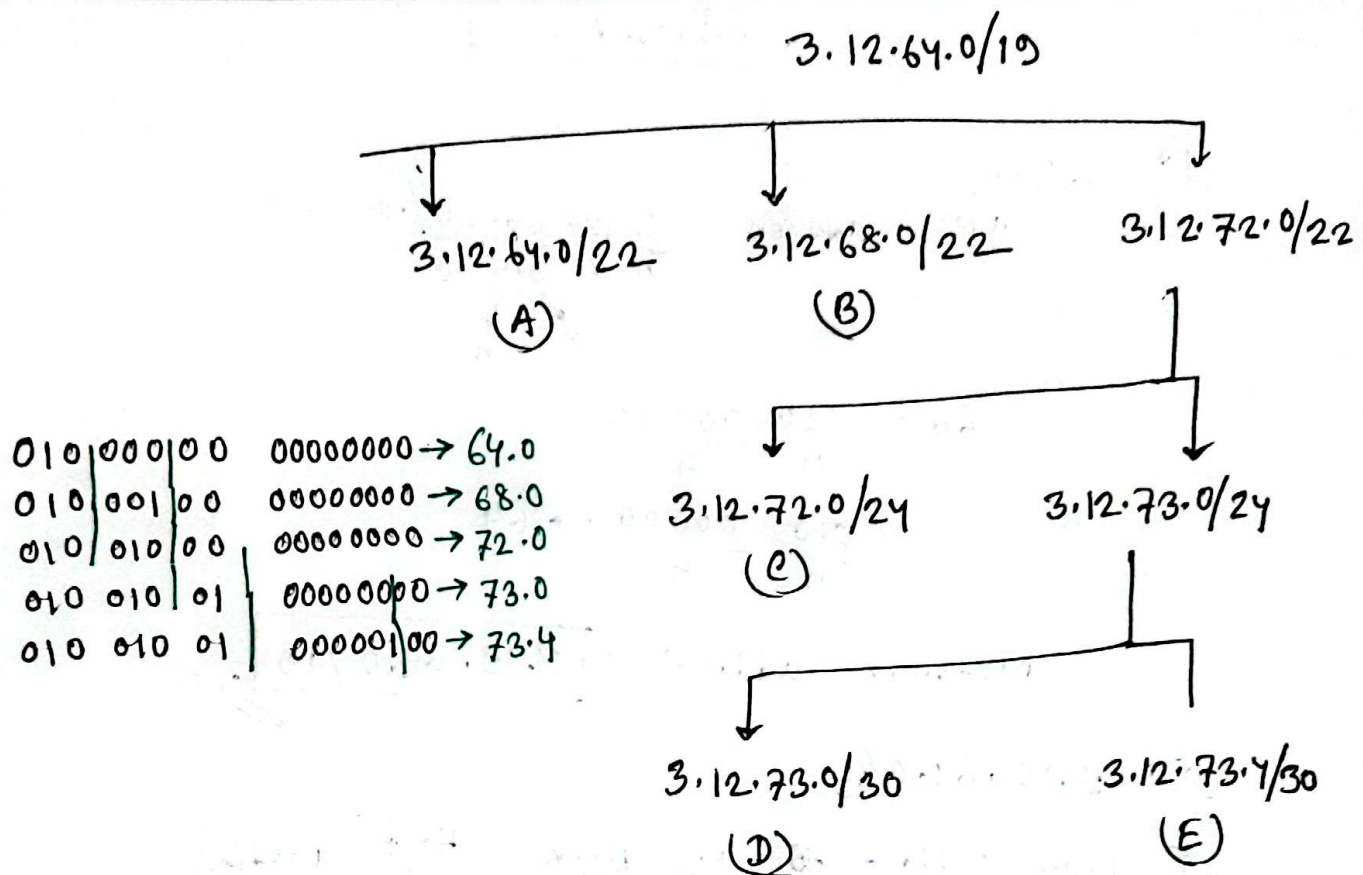
$$\frac{010}{n} \cdot \frac{00000}{h} \rightarrow 64$$

$$\therefore \text{Network address} = \boxed{3.12.64.0 / 19}$$

II

3.12.64.0/19

Name	Host	Host + 2	Block size	Host bits	prefix
A	1001	1003	1024	10	22
B	511	513	1024	10	22
C	129	131	256	8	24
D	2	4	4	2	30
E	2	4	4	2	30



③ Number of IP address wasted for the R2 LAN

$$= 1024 - 1003$$

$$= \underline{\underline{21}}$$

Ques-02

- ① Directly connected networks in a routing table identified by marked as C (connected) in routing table.

Example :- C 192.168.1.0/24 is directly connected, G0/0
↑
Directly connected route

② ip route 0.0.0.0 0.0.0.0 192.10.11.2

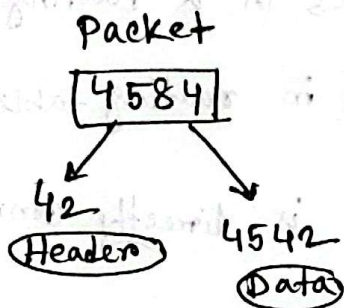
③ ip route 0.0.0.0 0.0.0.0 S1/0/1 5

④ [40 / 0] → cost to reach destination
↓
Trustworthiness of the route / Administrative distance

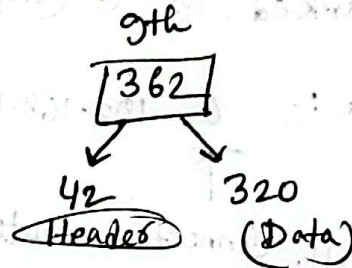
- ⑤ A directly attached static route is better than a recursive static route because it specifies the exit interface directly where a recursive route needs two lookups to reach the next hop. Thus, this makes directly attached static routes are faster, more efficient and less dependent on other ~~and~~ routing table entries.

Ques-03

I



MF=1. So, it is not last fragment.



$$\therefore X = 362$$

II

$$\begin{aligned}\text{Fragment offset for 5th packet} &= \frac{\text{Initial start} + (n-1) \times (\text{MTU} - H)}{8} \\ &= \frac{0 + (4 \times 320)}{8} \\ &= 160\end{aligned}$$

III

$$\begin{aligned}\text{Total number of fragmented packet} &= \left\lceil \frac{4542}{320} \right\rceil \\ &= 15\end{aligned}$$

Ques - 04

- ① When a link-state routing algorithm is used, R3 learns the route to PC C in one iteration because all routers quickly share their link information with each other using Dijkstra's algorithm.
- ② Using same algorithm, R1 detects the loss of its connection to R4 ~~through~~ when it stops receiving regular Hello packets from R4. When this happens, R1 understands the link is down and informs the other routers.

Ques - 05

- ①. 2001:0db8:12a4:0001:0000:0000:0000:0003

Address type : Global Unicast Address

Purpose : This type of address is used to communicate publicly.

- ②. 0000:0000:0000:0000:0000:0000:0000:0000

Address type : Unspecified Address

purpose : This address is used by a device when it does not yet know its own ip address, such as during software installation.

Ques-06

Some routers or firewalls block ICMP traffic for security reasons because ICMP can be misused for network scanning or denial-of-service attacks.

For example, ICMP Echo Request (ping) messages may be blocked so that attackers can not use ping to check whether a device or network is active, reducing the risk of scanning and attacks.

Ques-07

When the DF (Don't Fragment) Flag = 1, it means the packet must not be fragmented. In this case, MTU Discovery becomes significant because it helps the sender determine the maximum packet size that can traverse the network without fragmentation. If a larger packet sent with DF = 1, it will be dropped and an ICMP "Fragmentation Needed" message is returned and allowing the sender/source to adjust the packet size. This ensures efficient and reliable transmission without fragmenting packet.

Ques - 08

The DHCP process follows the DORA steps.

Discover → Offer → Request → Acknowledgement

Even though the client has chosen a specific server, other servers need to see the request so they know not to allocate that IP to someone else.

When renewing an IP lease, the client usually sends the DHCP Request directly (unicast) to server that generated the lease, because it already knows the server and network, so broadcasting is unnecessary.

Ques - 09

- ① Rajib's game server is on a private network, meaning it has private IP address that is not accessible from the internet. External players like Saif cannot connect because the router blocks incoming connections by default.
- ② Rajib can use port forwarding on his home router to forward the game server's port to his machine's private IP. This allows external players to reach the server using the router's public IP and the specified port.

Ques-10

① This configuration is called a anycast IPv6 address. In anycast address, multiple devices share the same IP and the network automatically routes traffic to the nearest server. This ~~is~~ exception made to allow a single IP to represent servers without conflicts, which is normally not allowed for unicast addresses.

② Benefits:

performance — Users are automatically connected to the closest server that reduce latency and improving response time.

Reliability — If one server fails, traffic is reroute to the next available server with the same anycast address that ensures high availability for global services.

Ques-11

I When Host X wants to send an IP packet to Host Y, it does not know Y's MAC address. Therefore, X sends an ARP request as a broadcast frame with destination MAC = FFFF. Host Y responds with its MAC, after which X can send frames directly to Y using that MAC. ARP helps map the IP address to the MAC address.

II Switches are self-learning because they record the source MAC address and incoming port of each frame. In this scenario, when X's ARP broadcast passes through the switch, the switch saves MAC on X's port, allowing future frames to be forwarded only to the correct port instead of flooding the network.