

Answer to the question - 1

a) Default gateway IP address : 109.0.8.253
 supported hosts = 2045

$$2045 + 2 = 2047 \quad | \quad 2048 \quad | \quad \begin{array}{l} \text{no of host bits} \\ \log_2(2048) \\ = 11 \end{array}$$

\therefore number of host bits = 11

$$\therefore \quad " \quad \quad \quad \text{network bits} = (32 - 11) \\ = 21$$

Subnet mask: /22

$$\begin{array}{ccccccccc} 1 & 1 & 1 & 1 & 1 & 1 & 1 & . & 1 & 1 & 1 & 1 & 1 & 1 & . & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ \downarrow & & & & & & & & \downarrow & \\ 255 & . & & & 255 & . & & & & 248 & . & 0 \end{array}$$

$$\therefore \text{block size} = 256 - 248$$

$$= 8$$

$$\therefore \text{network address} = 109.0.8.0$$

$$\therefore \text{range} = 109.0.8.0 - 109.0.15.255$$

We know, last address is the broadcast address,
 so, broadcast address is 109.0.15.255

$$\textcircled{11} \text{ Host size} = 2^n - 2$$

$$= 2^{11} - 2$$

$$= 2046$$

\therefore total usable hosts = 2046.

5) From (Q) i,

network address = 109.0.8.0/21

\therefore

Network	Required Hosts	Host Bits	Subnet	Network Address
LAN(1)	500	9	123	109.0.8.0/23
LAN(2)	255	8	124	109.10.0/23
Switch	4	3	129	109.0.12.0/29
Wan Link	2	2	130	109.0.12.0/29 11110000 0

		host bit ($\log_2(\text{number})$)	mask	Subnet generator	Network Address
502	512	9	$32-9=23$	$128+64+32+16+8+4+2+1 = 2^8 + 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 = 252$	109.0.12.8/23
257	256	8	$32-8=24$	$128+64+32+16+8+4+2 = 2^8 + 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 = 254$	109.0.12.8/23
6	8	3	$32-3=29$	$2^8 + 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 = 255$	$109.0.12.0/29$
4	4	2	$32-2=30$	$2^8 + 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0 = 256$	$109.0.12.0/29$

Answer to the Q-2

a) Traceroute sends packets with increasing TTL values starting from 1. When the packet reaches the destination, it responds with an ICMP echo reply, instead of an ICMP time exceeded message. Receiving this reply confirms that the destination has been reached.

b) Given,

① Total length = 1995 bytes

header size = 25 bytes

Data length from last packet = 900 bytes

number of fragment = 12

∴ Data per fragment = $(1995 - 25) \times 12$ bytes

= 1920 bytes

∴ total data = $(12 \times 1920) + 900$

= 23940 bytes

∴ original datagram size = $(23940 + 25)$ bytes

= 23965 bytes (Ans)

(ii) Packets 1 through 21,

$$\text{Bytes} = 21 \times 1920$$

$$= 21120 \text{ byte}$$

we know,

$$\text{Fragment offset} = \frac{\text{Bytes}}{8}$$

$$= \frac{21120}{8}$$

$$= 2640$$

(Ans)

(iii) The last packet in a fragmented group is identified by the MF flag which must be set to 0. If, MF=0 this is the last fragment. Otherwise MF=1 means more fragments are coming.

Q) The BRACU router is unable to send packets through the internet because the internal network uses private IP addresses, which are not routable on the public internet. The solution is to configure PAT on the border routers, so that, multiple internal hosts can share a single public IP address when accessing the internet as BRACU router has 500 hosts.

Answer to the Q-4

Subnet : /25 or 255.255.255.128

Q) ip route 43.11.192.0 255.255.255.128 s0/0

5) through switch(s), /26 \Rightarrow 255.255.255.192

ip route 21.1.64.0 255.255.255.192 212.29.85.2 10

In multi-access network via a switch, multiple routers share the same medium. That's why,

static routers must specify the next hop IP address to avoid ambiguity. ~~unless they~~ could have we point to point links with exit interface which ~~will~~ will not work because routers need to know which specific device to forward.

c) Static routers show or marked as 'S' in the routing table or may show 'S*' for static default routes.

for C,

it will show codes, (not way of last result is not set and C entries for directly connected networks.

Answer to the Q-5

- b) The flow table is used to tag packets of a specific flow of packets so that routers can handle them efficiently with consistent quality of service.
- c) Tunneling is used when two IPv6 networks need to communicate across an IPv4 infrastructure. Dual stack routers are placed at the border of the IPv6 networks where they connect to the IPv4 internet to perform encapsulation.

Answer to the question

a) MAC and IP address differences are.

Addressing of MAC address is physical.

On the other hand, IP address is logical.

Second one is MAC address is assigned by manufacturer.

On the other hand, IP is assigned by a network administrator.

b) Host A will receive the MAC address of the default gateway and creates ethernet frame with destination MAC, source MAC and IP packet. Then sends frame to gateway and gateway routes packet towards Host m

② for SW1,

MAC address	Port
MAC-A	Fa0/1
MAC-B	Fa0/2
MAC-C	Fa0/3

For SW2,

MAC	Port
MAC-B	Fa0/1