Q1 a

i) Third Octet block size = $256 - 128 = 128$

$\qquad$ ranges are 128-255

$\therefore$ Network address $\cdot$17$\cdot$50.0.0 /17

$\qquad$ Broadcast address 17.50.127.255

ii) Default getaway : usable hosts start at network +1

$\qquad \therefore$ Default getaway 17.50.0.2.

Q1 (B)

S_one 512 hosts, s_three 254 hosts.
S_three 13 hosts, 4 routers interfaces.

Prefix calculations $\quad 2^{10} - 2 = 1022 \rightarrow$ /22

$\qquad$ 255 hosts $\rightarrow 2^9 - 2 = 510 \rightarrow$ /23

$\qquad$ 13 hosts $\rightarrow 2^4 - 2 = 14 \rightarrow$ /28

$\qquad$ 4 hosts $\rightarrow 2^3 - 2 = 6 \rightarrow$ /29.

$\therefore$ S_One : 17.50.0.0 /22
$\qquad$ S_Three : 17.50.4.0 /23
$\qquad$ S_Three (13) : 17.50.6.0 /28
$\qquad$ LAN $\quad$: 17.50.6.16 /29

Q2 (a)

i) Two DHCP configuration prooblems
   i) wroong network address in pool.

    Correct: network 10.10.1.0 255.255.255.0

ii) Web server has static IP 10.10.1.253/24

    Correct: ip DHCP excluded address 10.10.1.253

ii) Set relay on R_Three, interface toward
    R_Three_LAN

command: ip helped-address <R_ONE-interface
            -Ip-reachable-from-R_three>

iii) Relay interface stays the same. Only
    the helper-address target changes
    to the WAN-reachable IP of R_ONE.

Q2(b)

i) last fragment starts at byte 182×8
                  $= 1456$

Total Data $= 1456 + 208 = 1664$ bytes.
Original packet size $= 1664 + 22$
                      $= 1686$ bytes.

ii) MTU = fragment total size = 230 bytes

offset step = data/8 = 208/8 = 26

6th fragment offset = (6-1)×26 = 130

iii) 6th is not last.

∴ MF = 1.

Q3 (a)

i) Algorithm name Distance Vector routing.

ii) A's neighbors : B(5), C(2), F(4)

Updated distance

Dest	Cost
A	0
B	5
C	2
D	6
E	7
F	4
G	8
H	∞
I	5
J	∞
K	∞

Q3 (B)

Link state requires keeping track of neighbors because each router must advertise its directly connected links via LSAs so every router can build the full topology graph and run Dijkstra for shortest paths.

Q3 (C)

Distance vector may not reflect the real shortest path due to slow convergence, routing loops and count to infinity, since routers have no global topology view and rely on neighbor's information.

Q4 (a)

i) Directly attached route:
  ip route 1.1.0.0 255.255.255.0 50/1 5

ii) Backup route:
  ip route 1.1.0.0 255.255.255.0 1.7.2.1 10

Q4(b)

Without a static default route, the router has no gateway of last resort; packets for unknown networks are dropped.

Q4 (c)

0 = metric for static route
50 - Administrive distance manually set higher than 1 to make it a floating static route.

Q5 (a)

Anycast : One address assigned to multiple nodes; routing delivers to the nearest one.

Multicast: one sender to all members of a multicast group.

Example: Anycast DNS/CDN - clients automatically reach the closest server for lower latency.

Q5(b)

IPV6 routers do not fragment.
If packet > MTU:
- Router drops packet and sends ICMPv6 "Packet Too Big".
- Source uses path MTU Discovery, reduces size.

Q5(c)

SLAAC is stateless because there is no server maintaining bindings.
Process: Router Advertisement provides prefix → host forms address (Prefix + interference ID/random) → runs DAD → Uses router as default geteway.

Q-6(a)

IP: Hierarchical → scalable routing via aggregation.

MAC: Flat → used for local frame delivery on the same link.

Q6(b)

ARP request from A is broadcast.
SW1: learns A's MAC on Fa0/1, floods ARP out other ports.
SW2: learns A's MAC on its Uplink (Fa0/1), floods out other ports.
MAC table changes: both switches add/update entry for A; existing entries stay.

Q6(c)

Ethernet preamble field:
7 bytes: alternating 10101010 pattern.
1 byte: SFD = 10101011
Reciever detects SFD to know the preamble ended and the frame begins.