4 (a) (i) Network Address: 200.96.0.0/12

(ii) Default Gateway: 200.111.255.253/12

(b)

Devices	Hosts	Network Address
S-THREE	$1024 \rightarrow 2^{11}$	200.96.0.0
S-THREE	$250 \rightarrow 2^{8}$	200.96.8.0
S-ONE	$100 \rightarrow 2^{7}$	200.96.9.0
Switch	$4 \rightarrow 2^{3}$	200.96.9.128
WAN-1	$2 \rightarrow 2^{2}$	200.96.9.136
WAN-2	$2 \rightarrow 2^{2}$	200.96.9.140

2 (a) (i) Given offset = 186 last fragment = 268 bytes

original intact packet size = $186 \times 8 + (268 - 20) = 1756$ bytes

(ii) MTU = 268 offset = $\frac{(4 * 248) + 8}{8} = 125$

(iii) MF = 0

(b) (i) Router interface f0 has IP 1.1.0.254/24, but DHCP pool network is 1.1.0.0/23 and default router in DHCP pool is 1.1.0.255, which may not be the router's actual interface IP.

(ii) Ensure DHCP pool network matches the router's LAN subnet or configure DHCP relay if server is in a different subnet.

3| (a) (i) Dijstra's Algorithm

	A	B	C	D	E	F	G	H	I	J	K
A	0	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
C		5	[2]	∞	9	4	∞	∞	∞	∞	∞
F		5		6	9	[4]	∞	∞	∞	∞	∞
B		[5]		6	9		∞	∞	5	∞	∞
I				6	8		∞	∞	[5]	∞	∞
D				[6]	8		∞	∞		7	∞
J					8		∞	∞		[7]	∞
E					[8]		∞	∞			10
G							[10]	∞			10
K								12			[10]
H								[12]			

(b) Link state algorithm is better because each ~~network~~ router knows the entire network topology, so shortest path computation is accurate, avoids routing loops and converges faster

(c) The count to infinity problem, where routing updates propagate slowly hop-to-hop, especially after a link failure

4|

(a) (i) ip route 0.0.0.0 0.0.0.0 1.1.1.2

(ii) ip route 0.0.0.0 0.0.0.0 1.1.2.2 5

(b) (i) ip route 1.1.0.224 255.255.255.224 1 1.4.1

(ii) Reduces routing table size on R2 by advertising one route instead of four.

(c) Route name:- floating static default route

Why AD: 50; AD=50; AD is set higher than the primary route's AD so it is used only as a backup.

5| (a) First 8 bits are ff

Broadcast using multicast: Send to FF02::1

(b) IpV6 does not have Options field extra information is added using extension Headers. Extension headers are placed between the IpV6 base header and upper layer header

(c) The base IpV6 header remains fixed at 40 bytes. Adding 20 bytes creates an extension header, making the total packet size 60 bytes, not changing the base header size.

(d) In stateful DHCPV6, the DHCPV6 server assigns IpV6 addresses. The server ensures address uniqueness, so Duplicate Address Detection is unnecessary.

Client sends DHCP v6 message. Server replies then

Client sends Request to accept the offer. Server responds with reply containing IpV6 address and configuration. Client configures the assigned IpV6 address.

6|

(a) In ethernet MAC addressing, the U/L bit in the first octet identifies the type of address.

A2 = 1010 0010

The 7th bit from the left is the U/L bit. Here that bit is 1. which means the address is locally administered.

(b) Switches learn MAC addresses by examining the source MAC of incoming frames. When the ARP request from Host A arrives, the switch will learn Host A's Mac address and map it to the receiving port. No existing entries for B, C or D are modified.

(c) The Preamable field of the Ethernet header helps in clock synchronization between two communicating devices so that the recievers can correctly interpret the incoming bits. while the CRC in the Ethernet trailer is used for error detection by allowing the recieve device to verify the integrity of the transmitted frame and determine whether any bit errors occured during transmission.