Instructions: **Answer FIVE Questions only. Each carries 20 marks.**

Question 1 **(20 marks)**
Answer FOUR parts only. Each carries 5 marks:

i) **Explain the five classes of IP address**

ii) **Write short notes on Cyclic Redundancy Checks (CRC)**

iii) **Explain how Pulse Code Modulation (PCM) allows for digitized voice**

iv) **How is ICMP used by the traceroute command to show the route followed to a destination machine?**

v) **What is a parity bit and to what should the parity bit be set for the following:**
a) 1010101 – odd parity
b) 1111111 – even parity
c) 0000000 – even parity

Question 2 **(20 marks)**
Answer all parts

i) **Describe the main features of the IP protocol.** **(3 marks)**

ii) **What is fragmentation and why is it sometimes needed?** **(2 marks)**

iii) **Describe the process of fragmentation & reassembly. How are the IP header fields - Identification and Fragment Offset used in this process** **(8 marks)**

iv) **How does IP handle fragment loss?** **(4 marks)**

v) **How does Ipv6 handle fragmentation differently than Ipv4?** **(3 marks)**

Question 3 **(20 marks)**
Answer all parts

i) **Outline the structure of computer names used by the Domain Name System DNS.** **(4 marks)**

ii) **Describe the DNS server architecture.** **(4 marks)**

iii) **Outline the process of name resolution.** **(8 marks)**

iv) **Explain how DNS improves performance through caching.** **(4 marks)**

Question 4 **(20 marks)**
Answer all parts

i) **Describe and fully distinguish between Repeaters and Bridges outlining**

their relative advantages/disadvantages **(8 marks)**

ii) **Describe how filtering bridges know whether to forward a frame onto another LAN segment or not.** **(4 marks)**

iii) **Multiple bridges can introduce the problem of a cycle of bridges. Explain this problem and how it is overcome.** **(6 marks)**

iv) **Briefly distinguish between hubs and switches** **(2 marks)**

Question 5 (20 marks)

Answer all parts

i) **What is address resolution?** **(3 marks)**

ii) **Describe three techniques used in address resolution** **(6 marks)**

iii) **Detail the operation of the Address Resolution Protocol (ARP)** **(7 marks)**

iv) **Outline what optimization ARP makes to improve performance** **(4 marks)**

Question 6 (20 marks)

Answer FOUR parts only. Each carries 5 marks:

i) **How is encryption used to authenticate the sender of a message?**

ii) **Discuss the scheme of address management and renewal as used by DHCP.**

iii) **Briefly describe the SNMP network management model.**

iv) **What is a firewall and how does it function?**

v) **For each of the following scenarios, give the subnet mask and identify how many hosts per subnet could be supported.**

a) A company with a network address of 137.128.0.0 wants to segment the network into 25 different subnets.

b) A company with a network address of 107.139.0.0 wants to segment the network into 40 different subnets.

c) A company with a network address of 158.240. 0.0 wants to segment the network into 10 different subnets.

Question 7 (20 marks)

Answer all parts

i) **Describe the architecture of Internet mail.** **(5 marks)**

ii) **Outline the main features of the Simple Mail Transfer Protocol (SMTP)** **(5 marks)**

iii) **Detail the process of mail retrieval by clients using the POP protocol** **(6 marks)**

iv) **Write a brief note on Multipurpose Internet Mail Extensions (MIME)** **(4 marks)**