(Time: 2½ hours)

Total Marks: 75

N. B.: (1) **All** questions are **compulsory**.
    (2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
    (3) Answers to the **same question** must be **written together**.
    (4) Numbers to the **right** indicate **marks**.
    (5) Draw **neat labeled diagrams** wherever **necessary**.
    (6) Use of **Non-programmable** calculators is **allowed**.

1. **Attempt _any three_ of the following:**   **15**
a. Explain the types of transmission modes for data flow.
b. Discuss the advantages and disadvantages of different network topologies.
c. What is Shannon capacity of noisy channel?
    The signal-to-noise ratio is given as 36dB and the channel bandwidth is 2 MHz. Calculate theoretical channel capacity.
d. What are the different types of transmission impairments?
e. Distinguish between data rate and signal rate.
    A signal is carrying data in which one data element is encoded as one signal element (r=1). If the bit rate is 100kbps, what is the average value of the baud rate if c is between 0 and 1?
f. Define constellation diagram. Explain its role in analog transmission.

2. **Attempt _any three_ of the following:**   **15**
a. Describe the goals of multiplexing. Which are the 3 multiplexing techniques?
b. Define FHSS (Frequency Hopping Spread Spectrum). Explain how it achieves bandwidth sharing.
c. Discuss the advantages and disadvantages of optical fiber.
d. Explain the two technologies of circuit switching.
e. List and explain the services provided by data link layer.
f. How does a single-bit error differ from a burst error?

3. **Attempt _any three_ of the following:**   **15**
a. Compare and contrast flow control and error control.
b. Explain the working of stop-and-wait protocol.
c. Discuss the concept of pure ALOHA.
d. Write note on TDMA (Time Division Multiple Access).
e. Discuss _any five_ characteristics of standard Ethernet.
f. Write short note on routers.

4. **Attempt _any three_ of the following:**   **15**
a. List and explain the services provided by network Layer.
b. Write short note on NAT (Network Address Resolution)

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c. What is fragmentation? Discuss the three fields in an IP datagram related to fragmentation.
d. How to overcome instability in distance vector routing algorithm.
e. Discuss different timers in RIP (Routing Information Protocol).
f. Differentiate between IPv4 and IPv6.

5. Attempt *any three* of the following: **15**
a. Explain the concept CSMA/CA.
b. Explain the services provided by User Datagram Protocol (UDP).
c. Discuss the three-way handshaking in TCP (Transmission Control Protocol) for connection establishment.
d. Explain the process of transferring a mail.
e. Explain the architecture of World Wide Web (WWW).
f. Briefly explain the different timers in TCP (Transmission Control Protocol).

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