

**Master of Computer Science & Engineering(Internet of Things) 1st Year 1st Semester - 2025
Communication and Protocols**

Time: 3 Hrs

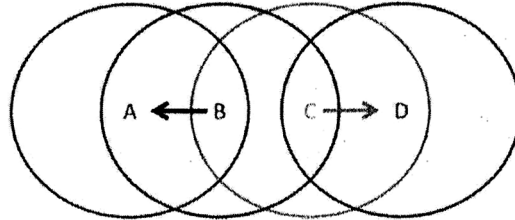
Marks: 100

Answer any five questions

1. i) Explain the Shannon and Hartley channel-capacity theorem and its application in spread-spectrum signal-spreading operation.
ii) Describe a general model of the spread spectrum system.
iii) How the spread spectrum tackles issues like a) interference and anti jamming b) fading c) interception?
iv) Consider a FHSS scheme which is using MFSK modulation technique with carrier frequency f_c equal to 250 kHz, difference frequency f_d equal to 25KHz, and M equal to 8 (L equal to 3 bits). Make a frequency assignment for each of the eight possible 3-bit data combinations.
v) What is the free space propagation model? Derive the relationship between the transmitted power and received power in the free space propagation model.

5X4=20

2. i) Explain the access method of wireless LAN.
ii) Consider the following scenario: Assume, node B is sending to node A, and node C wants to send to node D. As, node C receives packets from node B, carrier sense would prevent it from sending to node D, even though it wouldn't interfere. Explain with a proper sketch how this problem can be solved.



- iii) Describe the layered architecture of Bluetooth in respect to core protocols.
iv) How do masters and slaves within a piconet avoid bad channels?
v) What are the different types of a frame in the baseband layer of Bluetooth? Explain the purpose of F, A and S subfields of header of a Bluetooth frame.

5X4=20

3. i) What are the different types of data transmission models used in IEEE 802.15.4?
ii) Explain the IEEE 802.15.4 MAC layer with a flow diagram.
iii) Compare ZigBee and Bluetooth.
iv) What are the different methods for clear channel assessment? Explain briefly.
v) Why receiver energy detection is required in ZigBee? How is it related to LQI?

5X4=20

[Turn over

4.
 - i) Explain the architecture of LoRaWAN network
 - ii) What is LoRa Chirp modulation technique?
 - iii) Explain the Time Slotted Channel Hopping (TSCH) approach used in WirelessHART.
 - iv) How WirelessHART achieves energy efficiency?
 - v) What are the major systems of the GSM network? Illustrate and describe the architecture of the GSM network.

5X4=20
5.
 - i) Describe different fields of IPv6 datagram. Compare IPv4 and IPv6 packet headers.
 - ii) How IPv6 ICMP manages destination unreachable and packet too big errors?
 - iii) What are the different types of ICMPv6 packets used in the Neighbour Discovery Protocol? Explain their roles briefly.
 - iv) Explain the tunneling and reverse tunneling approaches used in Mobile IP.
 - v) Illustrate and describe the bidirectional tunneling approach used in MIPv6.

5X4=20
6.
 - i) Why is IPv6 not suitable for all IoT applications? Explain the approach to overcome this issue.
 - ii) Describe the routing mechanisms used in 6LowPAN.
 - iii) How the Low Power and Lossy Networks (LLNs) features are supported in routing algorithms?
 - iv) Describe a routing protocol for LLNs.
 - v) Explain the working of the 6TiSCH network with IPv6 with a schematic diagram.

5X4=20
7.
 - i) Which transport layer protocol is used in VoIP applications? Explain how it provides fault tolerance.
 - ii) Explain the working of multipath TCP.
 - iii) Which application layer protocol is suitable for low power sensors? Explain that protocol briefly.
 - iv) What is cellular system capacity? What is the impact of cellular frequency reuse and cell size on system capacity?
 - v) What are the different types of handoff strategies used in cellular systems? Explain briefly.

5X4=20