Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

End Term (Odd) Semester Examination November 2025

Roll no.....

Name of the Course and semester: **B-Tech (ECE), V Semester**
Name of the Paper: ***Data Communication Network***
Paper Code: TEC-504
Time: 3 hour Maximum Marks: 100

Note:

(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.

Q1. (2X10=20 Marks) CO-01

a. Differentiate between LAN, MAN, WAN, and Wireless Networks based on their coverage area, transmission technology, speed, and typical applications.
b. Describe the different types of transmission media used in the Physical Layer. Explain the concepts of data and signals, digital and analog transmission, and how bandwidth utilization is achieved through multiplexing and spreading techniques.
c. Compare and contrast the OSI reference model and the TCP/IP reference model.
Explain the functions of each layer, highlighting similarities, differences, and the importance of protocol layering.

Q2. (2X10=20 Marks) CO-02

a. Explain in detail the functions of the Data Link Layer in the OSI model. Discuss how framing, error control, and flow control are implemented at this layer.
b. Describe the error detection and correction mechanisms used in the Data Link Layer. Compare and contrast Parity Check, Checksum, and Cyclic Redundancy Check (CRC) techniques in terms of efficiency, complexity, and reliability.
c. What are the different Medium Access Control (MAC) protocols used in the Data Link Layer? Explain the working principles of ALOHA, CSMA/CD, and CSMA/CA and discuss their advantages, limitations, and real-world applications.

Q3. (2X10=20 Marks) CO-03

a. Explain the role and functions of the Medium Access Control (MAC) sub-layer in the OSI reference model. Discuss how it helps in channel allocation, addressing, and frame delivery in shared communication media.
b. Compare and contrast different channel allocation methods used in the Medium Access Sub-Layer such as static channel allocation, dynamic channel allocation, and controlled access methods. Illustrate with suitable examples and diagrams.
c. Describe the working principles of Random Access Protocols in the Medium Access Sub-Layer. Explain and compare ALOHA, Slotted ALOHA, and CSMA/CD in terms of efficiency, throughput, and collision handling mechanisms.

Q4. (2X10=20 Marks) CO-04

a. Compare and contrast circuit switching and packet switching, and message switching techniques used in network communication. Explain how each method affects delay, reliability, and resource utilization.
b. What is routing ? Differentiate between distance vector routing, link state routing, and hierarchical routing.
c. Explain in detail the working of Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). Compare them based on reliability, connection type, flow control and congestion control.

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Q5. (2X10=20 Marks) CO-05

a. Explain the functions of the Presentation Layer in the OSI model. Discuss how it provides data encryption services.

b. Describe the major functions of the Application Layer. Explain the working principles and roles of FTP and SMTP protocols in real-world network communication.

c. What is network security and why is it important in modern communication systems? Discuss the main security services—confidentiality, integrity and authentication—with suitable examples.