

Enrollment No.....



Faculty of Engineering / Science

End Sem Examination Dec-2023

CS3CO28 / BC3CO39 Data Communication

Programme: B.Tech.
/ B.Sc.

Branch/Specialisation: All / Computer
Science

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

- Q.1 i. Which theorem is related to the maximum data rate of a digital communication system? **1**
(a) Gauss's theorem
(b) Nyquist's theorem
(c) Fourier's theorem
(d) Heisenberg's uncertainty principle
- ii. What is the main purpose of Shannon's theorem in digital communication? **1**
(a) To define the components of a communication system
(b) To calculate the signal propagation delay
(c) To determine the maximum data rate with a given bandwidth and signal-to-noise ratio
(d) To explain the behavior of electromagnetic waves in transmission media
- iii. Which of the following is an example of a bipolar line code? **1**
(a) Unipolar NRZ (b) Polar RZ
(c) Manchester (d) AMI (Alternate Mark Inversion)
- iv. Which spread spectrum technique allows multiple users to share the same frequency band simultaneously, using different codes? **1**
(a) Frequency-Hopping Spread Spectrum (FHSS)
(b) Direct-Sequence Spread Spectrum (DSSS)
(c) Code Division Multiple Access (CDMA)
(d) Amplitude Modulation (AM)

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- v. Which of the following switching techniques is characterized by dedicated communication paths and is commonly used in traditional telephone networks? **1**
 (a) Message switching (b) Packet switching
 (c) Circuit switching (d) Hybrid switching
- vi. In a Datagram Network, data is divided into packets, and each packet is transmitted independently. Which type of service is typically associated with Datagram Networks? **1**
 (a) Connection-oriented services
 (b) Connectionless services
 (c) Packet-switched services
 (d) Circuit-switched services
- vii. What is the primary purpose of the Network Layer in the OSI model and the Internet Layer in the TCP/IP model? **1**
 (a) Data presentation (b) Error detection
 (c) Routing and addressing (d) Data link control
- viii. Which addressing type is used to uniquely identify devices on a local network segment and is typically assigned by the manufacturer of the network interface card (NIC)? **1**
 (a) Physical Address (b) Logical Address
 (c) Port Address (d) IP Address
- ix. Which of the following is an example of an error detection method? **1**
 (a) Data encryption (b) Parity checking
 (c) Data compression (d) Data encoding
- x. What does BER stand for in the context of data communication? **1**
 (a) Bit Error Recovery (b) Byte Error Rate
 (c) Bit Error Rate (d) Block Error Resolution
- Q.2 i. Differentiate between analog and digital signals. Provide examples of each. **2**
- ii. Explain Nyquist's theorem and its significance in digital communication. How does it relate to data rate limits? **3**
- iii. Discuss Shannon's theorem and its implications in digital communication. What is the relationship between data rate and bandwidth according to Shannon's theorem? **5**
- OR iv. Explain the concept of noise in digital communication. What are the common sources of noise? How can noise be mitigated in communication systems? **5**

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- Q.3 i. Explain the concept of multiplexing in digital communication. **2**
 ii. Explain the process of analog-to-digital conversion in digital communication. What are the advantages of using digital signals over analog signals? **8**
- OR iii. Differentiate between unipolar, polar, and bipolar line codes used in digital communication. Provide examples and discuss their applications. **8**
- Q.4 i. Differentiate between circuit switching, message switching, and packet switching. **3**
 ii. Compare and contrast connection-oriented services and connectionless services in communication networks. Provide examples of applications for each type of service. **7**
- OR iii. Study various types of network topologies. Conduct a comparative analysis of these topologies, considering their strengths and weaknesses. **7**
- Q.5 i. Explain the purpose and functionality of each layer in the OSI model. Why is layering important in network architecture? **4**
 ii. Compare and contrast the OSI (Open Systems Interconnection) model and the TCP/IP model. Highlight the number of layers, their names, and the key differences between these models. **6**
- OR iii. Enumerate various networking devices commonly used in computer networks. Discuss the role and functions of devices such as routers, switches, hubs, and firewalls. **6**
- Q.6 Attempt any two:
 i. Explain the concept of parity checking as a simple error detection method. How does it work? **5**
 ii. Describe the process of CRC error detection and how it can detect errors in transmitted data. **5**
 iii. Describe the different modes of sliding window protocols (e.g., Go-Back-N and Selective Repeat). **5**
