4E1307

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B. Tech. IV - Sem. (Main / Back) Exam., - 2025

Artificial Intelligence and Data Science

4AID4-07 Data Communication and Computer Networks

CS, IT, AID, CAI, CCS, CDS, CIT

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Name any three common network topologies.

Q.2 What is the purpose of communication protocols in a computer network?

Q.3 Which layers of the OSI model are combined into a single layer in the TCP/IP model?

Q.4 What is **line coding**, and why is it important in digital communication?

Q.5 What are the three main factors that affect the **performance** of a communication system?

Q.6 Differentiate between **IPv4** and **IPv6** addressing. Mention one advantage of **IPv6**.

Q.7 What is Quality of Service (QoS)?

Q.8 What is Forward Error Correction (FEC), and how is it different from error detection methods?

Q.9 What is **congestion control**, and why is it important in the network layer?

Q.10 What is the **Stop-and-Wait ARQ** protocol?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain the concept of data rate limitations in signal transmission and one factor that influences it.

Q.2 Define modulation and mention one advantage of using digital modulation techniques.

Q.3 What are the two main types of errors in data transmission? Provide a brief explanation of each.

Q.4 What is the main difference between CSMA/CD and CSMA/CA in managing data collisions?

Q.5 Explain the difference between **unicast**, **multicast**, and **broadcast** communication.

Q.6 Briefly describe the **leaky bucket** and **token bucket** algorithms and their role in traffic management.

Q.7 List and briefly describe any two protocols used for **email transmission**.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Given the following IPv4 subnet mask (255.255.255.192):

(a) How many subnets and hosts per subnet can be created?

(b) Identify the network address and broadcast address for the IP 192.168.10.65/26.

Q.2 A network experiences packet loss due to congestion. Suggest and explain two congestion control techniques the network layer can implement to mitigate this issue.

Q.3 In a sliding window protocol with a window size of 4, if frames 0, 1, 2, and 3 are sent and frame 1 is lost:

(a) How does the Go-Back-N protocol handle the error?

(b) How does the Selective Repeat protocol handle the error?

Q.4 A user reports that they cannot reach a website using its domain name, but accessing it via its IP address work fine. Diagnose and explain the most likely cause of this issue and propose a troubleshooting method.

Q.5 A network using Slotted ALOHA has a frame generation rate of 200 frames/second. If the time slot duration is 5 ms, calculate probability of successful transmission using the formula:

$$P=G\times e^{-G}$$

Where G is the average number of frames generated per time slot?
