

# Data Communication & Networks(EE2007)

Date: September 24, 2025

Course Instructor(s)

Mr. Khalid Ijaz

## Sessional-I Exam

Total Time (Hrs.): 1

Total Marks: 20

Total Questions: 4

23L-6157

Roll No

5B

Section

Ahmz

Student Signature

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Attempt all the questions.

### CLO 1: Describe Internet architecture and network performance parameters.

Q1: **Describe** how the OSI model operates when a user streams a live online lecture. **Describe** the role of each layer in ensuring smooth and reliable delivery of audio and video data. Also, **describe** the protocols in brief that can be used by the application layer to provide above service. [8 marks]

### CLO 2: Explain physical layer concepts in data communication including data rates, line coding schemes, and Shannon's capacity limits.

Q2: An image is  $1600 \times 1200$  pixels with 3 bytes/pixel. Assume the image is uncompressed. **Explain** how much transmission time is required to transmit an image over a 56-kbps DSL modem channel. [3 marks]

### CLO 2: Explain physical layer concepts in data communication including data rates, line coding schemes, and Shannon's capacity limits.

Q3: The signal-to-noise ratio is often given in decibels. Assume that  $\text{SNR}_{\text{db}} = 36$  and the channel bandwidth is 2 MHz. Explain what the theoretical channel capacity is for the noisy channel. [3 marks]

### CLO 3: Analyze the design principles involved in data link layer.

Q4: **Analyze** the generation of the Hamming code for the 4-bit data 1001 using even parity. Assume the receiver receives the code 0011101. **Analyze** the complete process of the Hamming technique to detect error. [6 marks]

1100

8421  
101  
110  
P<sub>even</sub>

# Data Communication & Networks(EE2007)

Date: November 5, 2025

Course Instructor(s)

Mr. Khalid Ijaz

## Sessional-II Exam

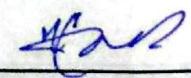
Total Time (Hrs.): 1

Total Marks: 15

Total Questions: 4

 Roll No

 Section

  
Student Signature

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Attempt all the questions.

### CLO 3: Analyze the design principles involved in data link layer.

Q1: Assume that, in a Stop-and-Wait ARQ system of a data communication network, the bandwidth of the line is 1 Mbps and it takes 20 ms to make a round trip. If each data frame has a length of 1000 bits, analyze the utilization percentage of the link. [2.5 marks]

### CLO 3: Analyze the design principles involved in data link layer.

Q2: A Pure ALOHA network transmits 200-bit frames over a 200 kbps shared channel. If the vulnerable time increases by 25%, analyze the channel utilization (%) when the system collectively generates 1000 frames per second. [2.5 marks]

### CLO 3: Analyze the design principles involved in data link layer.

Q3: A Wireless LAN employs the non-persistent CSMA protocol over a shared channel of 1 Mbps. Each data frame has a length of 1000 bits, and the propagation delay on the medium is 50  $\mu$ s. [1.5+1.5+1.5+1.5 marks]

1. Analyze the propagation time (a) as a fraction of the transmission time.
2. Using the approximate throughput efficiency expression for non-persistent CSMA:

$$S = \frac{Ge^{-aG}}{1 + 2aG}$$

Where G is the offered load (frames per frame-time), analyze the throughput (S) when G=0.5.

3. Analyze the channel utilization (%) for G=0.5.
4. Analyze how increasing the propagation time (larger a) affects system efficiency and collision probability.

### CLO 3: Demonstrate the application of network layer protocols.

Q4: Consider the network shown below, where Host H1 (running Process P1) sends a packet to Host H2 (running Process P2) through a set of routers (A, B, C, D, E) inside an ISP's network. Demonstrate the routing tables of all those routers, which are involved in communication process. [4 marks]

