

## SEMESTER END EXAMINATIONS – AUGUST 2024

<b>Program</b>	<b>: B.E. – CSE (Cyber Security) / CSE (Artificial Intelligence and Machine Learning)</b>	<b>Semester</b>	<b>: IV</b>
<b>Course Name</b>	<b>: Data Communication and Networking</b>	<b>Max. Marks</b>	<b>: 100</b>
<b>Course Code</b>	<b>: CY42 / CI42</b>	<b>Duration</b>	<b>: 3 Hrs</b>

### Instructions to the Candidates:

- Answer one full question from each unit.

### UNIT - I

- Enumerate the functions associated with each layer of TCP/IP reference model. CO1 (08)
  - With necessary diagrams, explain different types of network topology. CO1 (08)
  - Differentiate between host to host delivery and end to end delivery of data. CO1 (04)
- Explain the fundamental components of data communication systems with an example for each. CO1 (06)
  - The number of duplex mode liners in a mesh topology is  $n(n-1)/2$ . Justify the statement. List the merits and demerits of mesh topology. CO1 (08)
  - Differentiate between the following: CO1 (06)
    - Encapsulation and Decapsulation
    - logical and physical addressing.

### UNIT - II

- Draw the graph of unipolar NRZ, NRZ-I, Polar RZ, Manchester and Differential Manchester for the data stream 1001101010 assuming that the last signal level has been positive. CO2 (08)
  - Define bit rate and baud rate. Explain the line coding schemes with suitable examples. CO2 (06)
  - Illustrate the reasons for transmission impairments in data communication and explain the categories of transmission impairments. CO2 (06)
- What is SNR? How can we calculate  $SNR_{db}$  from SNR? For a channel of 1Mhz bandwidth and SNR 63, Calculate the appropriate bit rate and signal level. CO2 (08)
  - What is the total delay for a frame of size 5 million bits that are being sent on a link with 10 routers each router having a queuing time of  $2 \mu s$  and a processing time of  $1 \mu s$ . The length of the link is 2000km. The speed of light inside the link is  $2 \times 10^8$  m/s. The link has a bandwidth of 5 Mbps. Which component of the total delay is dominant? Which one is negligible? CO2 (06)
  - Discuss the use of Nyquist bit rate and Shannon capacity in computing the data rates. The signal-to-noise ratio is often given in decibels. Assume that  $SNR_{db} = 36$  and the channel bandwidth is 2MHz. Calculate the channel capacity. CO2 (06)

## UNIT - III

5. a) Define Cyclic Code and explain with neat block diagrams CRC encoder and decoder. CO3 (05)
- b) Consider a network engineer responsible for managing data transmission between two offices of a multinational corporation located in different cities. Node A has a data word "101001111" representing a segment of the financial report. Before transmitting this data to Node B, it needs to be encoded with CRC using the divisor "10111". Calculate Cyclic Redundancy Check. CO3 (10)
- c) Compare and contrast flow control and error control with suitable examples. CO3 (05)
6. a) Compare and contrast the Go-Back-NARQ Protocol with Selective-Repeat ARQ with appropriate timing diagrams. CO3 (10)
- b) Consider Alice wants to securely transmit a 4-bit message 1101 to Bob over an unreliable communication channel. She wants to ensure that the message reaches Bob without any errors. To achieve this, she decides to encode the message using Hamming code before transmission. Calculate the hamming code to ensure error detection during transmission. CO3 (06)
- c) Consider a binary code that contains 4 valid code words as follows: 00000,01011,10101,11110. Calculate  $d_{\min}$  and calculate the maximum number of erroneous bits that can be corrected by the  $d_{\min}$ . CO3 (04)

## UNIT- IV

7. a) Discuss the relevance of CSMA/CA and explain the strategies used for avoiding collision using a flow diagram. CO4 (08)
- b) Discuss different channelization techniques in detail. Calculate chip code for a network with 2 stations and 4 stations using Walsh table  $W_1 = [1]$ . CO4 (08)
- c) Compare CSMA with ALOHA protocol. CO4 (04)
8. a) Discuss the different persistence method and explain CSMA/CD with a neat flow diagram. CO4 (08)
- b) In a CSMA/CD network with a data rate of 10 Mbps, the minimum frame size is found to be 512 bits for the correct operation of the collision detection process. What should be the minimum frame size if we increase the data rate to
- i) 100 Mbps.
  - ii) 1Gbps.
  - iii) 10 Gbps.
- c) Discuss two controlled access protocols for media access. CO4 (06)

## UNIT - V

9. a) i) Discuss and differentiate the common physical layer implementation of Standard Ethernet with suitable diagrams. CO5 (08)
- ii) Consider the length of 10Base5 cable is 2500m. If the speed of a propagation in a thick coaxial cable is 200,000,000 m/s, how long does it take for a bit to travel from the beginning to the end of the network? Assume there is 10 $\mu$ s delay in the equipment.

- b) i) The address 43:7B:6C:ED:10:00 has been shown as source address in an Ethernet frame. The receiver has discarded the frame. Give reason. CO5 (06)  
ii) If an Ethernet destination address is 05:01:02:03:04:05, What is the type of the address? Give reason.  
iii) Show how the address 47:20:1B:2E:08:EE is sent out on line.  
iv) If an Ethernet destination address is FF:FF:FF:FF:FF:FF, what is the type of the address? Give reason.
- c) Explain the addressing mechanism of IEEE 802.11 protocol. CO5 (06)
10. a) Explain Bluetooth and its architecture with a neat diagram. CO5 (08)  
b) Explain Ethernet Frame format with a neat diagram. Consider an Ethernet MAC sublayer receives 32 bytes of data from the upper layer. How many padding must be added to the data? CO5 (06)  
c) i) Describe connecting devices based on the layers they operate in a network with a neat diagram. CO5 (06)  
ii) Which one has more overhead, a repeater or a bridge? Defend your answer.

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