

Ref. No. : Ex/EE/PC/B/T/412/2025

**B. E. ELECTRICAL ENGINEERING 4<sup>TH</sup> YEAR 1<sup>ST</sup> SEMESTER EXAMINATION, 2025**

**SUBJECT: - PRINCIPLES OF COMMUNICATION ENGINEERING &  
COMPUTER NETWORKS**

Time: Three hours

Full Marks 100  
(50 marks for each part)

Use a separate Answer-Script for each part

No. of  
Questions

**PART I**

**Marks**

*Answer ALL questions.*

1. What are the characteristic features of spread spectrum modulation? Describe in detail why and how are pseudo-noise sequences generated using a feedback shift register. (CO4) 03+05

OR

1. For a slow FH/MFSK signal, number of bits per MFSK symbol is 2 and the length of PN segment per hop is 3. The period of the PN sequence is 15. The hop rate is half of the symbol rate. One complete period of the PN sequence is 001 110 011 001 001 and the corresponding input binary data is 10101101001110010000. Describe in detail how the hopped frequencies will vary with time for one complete period of the PN sequence and plot it. (CO4) 08
2. (a) In digital communication differentiate between messages, characters and symbols. Why is 6-bit ASCII coding employed in text message communication? What are the characteristic features of bandlimited channels? (CO3) 08
2. (b) In baseband detection of noisy binary signals in digital communication, describe the importance of conditional pdfs employed and the two hypotheses tested for. How is  $(E_b/N_0)$  in digital communication related to the SNR in analog communication? (CO3) 08

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No. of  
Questions

PART I

Marks

OR

2. (a) Why is the receiver structure in AM or FM radio transmission termed as "Super Heterodyne" receiver? How can the image frequencies be suppressed by a superheterodyne receiver? (CO3) 04 +04
2. (b) When can an FSK signal be termed as Sunde's FSK? Derive the error probability of coherent FSK demodulators for Sunde's FSK signals. Describe in detail how a coherent demodulator can be designed for BASK signals. (CO3) 08
3. (a) Derive in detail the frequency spectrum of the modulated signal in conventional DSB AM. How is the power content of conventional DSB AM signal related to the power content of DSB-SC AM signal? (CO2) 06 +04
3. (b) A signal  $x(t) = m(t) + \cos 2\pi f_c t$  is applied to a nonlinear system whose output is  $y(t) = x(t) + \frac{1}{2}x^2(t)$ . The  $M(f)$  is shown in Fig. 1 where  $W \ll f_c$ . Determine and plot the frequency spectrum of  $y(t)$ . (CO2) 06

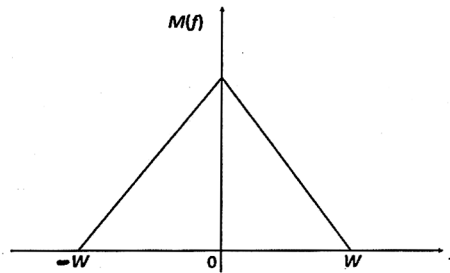


Fig. 1.

No. of  
Questions

PART I

Mar  
ks

OR

- |        |                                                                                                                                                                          |           |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 3. (b) | With suitable equations and phasor plots, establish in detail the similarities and dissimilarities between narrowband FM signal and conventional DSB AM signal.<br>(CO2) | 06        |
| 4.     | Write short notes on <i>any two</i> of the following:<br>(CO1)                                                                                                           | 05<br>+05 |
|        | (i) Shot noise and thermal noise in communication systems.<br>(ii) Instantaneous frequency in AM and FM.<br>(iii) Importance of Bessel function in wideband FM.          |           |

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**B.E. ELECTRICAL ENGINEERING FOURTH YEAR FIRST SEMESTER  
EXAMINATION 2025**

**Principles of Communication Engineering and Computer Networks**

**Time:** Three Hours

**Full Marks:** 100

(50 marks for each part)  
Use a separate Answer-Script for each Part

**PART-II**

Answer *all* questions from this part.

1. a) Why protocols and protocol architecture model are required in data communication network (CO2)? 3
- b) Briefly explain the functions of data link layer and session layer in ISO/OSI architecture model (CO2). 3

**OR**

- a) What is transmission impairments and what are the main causes it? How the channel capacity can be determined for noisy and noiseless channel (CO1)? 3
- b) The power of a signal is 10 mW and the power of the noise is 1  $\mu$ W. Find the values of SNR and SNR in dB and also the data rate of a channel having bandwidth 1600 Hz (CO1). 3
2. a) A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is  $x^3+1$ . Show the actual bit stream transmitted. If the 3<sup>rd</sup> bit from the left is inverted during transmission, show how this error can be detected at the receiver (CO3) 6
- b) What is differential encoding? With neat sketches show the signals to be transmitted using i) NRZ-L and ii) NRZ-I encoding to transmit the binary data 110111010. Explain the differences between NRZ-L and NRZ-I encoding schemes (CO3). 1+3
- c) Why are the wires twisted in twisted pair cable? What is the difference between UTP and STP cables (CO3)? 2

OR

- a) Find out the Checksum value of 1001001110010011 and 1001100001001101 16-bit data. Mention one application where it is used for error detection and its limitations (CO3). 4
- b) Show the waveform of the digital signal to be transmitted using (i) Differential Manchester and (ii) Bipolar AMI encoding techniques for the binary data 1101111010. Also mention the relative merits and demerits of the two methods. (CO3). 4
- c) Describe the different components of optical fiber cable. Why CAT-5 cables can carry more data over longer distance than CAT-3 (CO3)? 2+2
3. a) What are hidden station and exposed station problems? How do RTS and CTS signals help to solve the problems of hidden and exposed stations (CO4)? 5
- b) Briefly explain the following terms in context with LAN: (CO4)  
10Broad36, 100Base-T, 100Base-F 4
- c) What are the functions of a LAN bridge (CO4)? 3

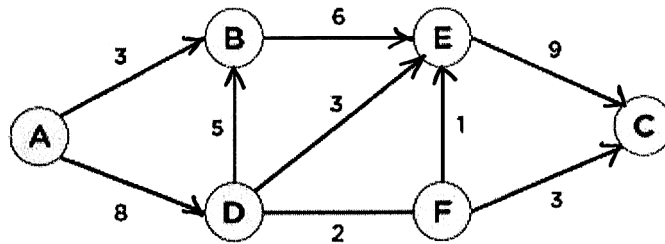
OR

- a) Explain how datagram packet switched network transfer information from source to destination (CO4).  
Mention the reasons for the delays that occur in circuit switched network. Give one example of circuit switched network (CO4). 5
- b) Explain medium access protocol for FDDI LAN (CO4) 3
- c) What are the different routing techniques used in packet switched network? Briefly explain flooding technique in this context (CO4) 4
4. a) Why Flow control is necessary during transmission of data from source to destination? Explain "Selective Repeat" flow control protocol (CO5). 5
- b) The TCP congestion window is at 24 Kbytes and Time Out occurs, then what will be the congestion window (cwnd) size and threshold (slow start threshold(ssthresh)) size? Explain with diagram the procedure for congestion avoidance (CO5). 5

- c) Find the shortest path from source node A to all other nodes using Dijkstra's

Algorithm (CO5)

6

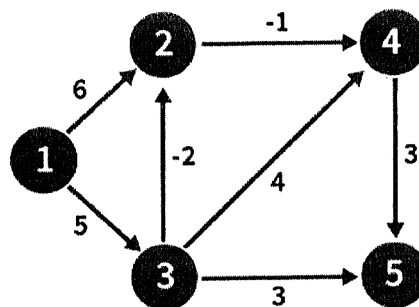


- d) Explain the role of 'Type of Service' and 'Flags' fields in IPV4 Header format (CO5).

4

OR

- a) The TCP congestion window is at 24 Kbytes and triple duplicate ACK occurs, then what will be the congestion window (cwnd) size and threshold (ssthresh) size? Explain with diagram the procedure to overcome this situation of congestion (CO5). 5
- b) How the inefficiency of Stop-and-Wait protocol is overcome in sliding window protocol? Explain "GO BACK N" flow control protocol (CO5). 5
- c) What is meant by negative weight cycle? How does the Bellman Ford algorithm overcome the limitations of Dijkstra's algorithm? Find out the shortest distance of each vertex from source node A as shown in the Figure below using Bellman Ford algorithm (CO5). 2+4



- d) Explain the roles of 'SYN' and 'FIN' fields in the TCP Header format. (CO5).

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