

**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  
**PART I**No. of  
Questions

Marks

*Answer all the questions.*

- 1.(a) What are the characteristic features of spread spectrum modulation? Why is an all zero state not permitted in a feedback shift register based PN sequence generator? (CO4) 04
- 1.(b) Describe in detail the operating principle of a transmitter used in a baseband spread spectrum system. (CO4) 04

OR

1. (b) Describe in detail the operating principle of a receiver used in a baseband spread spectrum system. (CO4) 04
2. (a) What are the roles of commutator and pulse modulator in time division multiplexing? Justify that, in a linear quantizer, signal-to-noise ratio for quantized pulses varies as a quadratic function of the number of quantization levels. (CO3) 03+06
2. (b) In digital communication, in baseband detection, what is correlation realization of matched filter? Differentiate between two-correlator based implementation and one-correlator based implementation of demodulators in digital bandpass communication using a suitable example. (CO3) 07

OR

2. (a) In digital communication, what is intersymbol interference and how can it be minimized? Under what circumstances nonuniform quantization is preferred over uniform quantization? What are  $\mu$ -law and A-law based companding characteristic? (CO3) 08

[ Turn over

No. of Questions	PART I	Marks
2. (b)	Prove that, in a coherent BFSK modulator, it is desired that the carrier frequency should be integer multiple of $(1/2T)$ and the frequencies $f_1$ and $f_2$ chosen should be integer multiple of $(1/4T)$ , where $T$ is bit period. (CO3)	08
3. (a)	How can an FM demodulator be built using an FM to AM converter? Prove that a balanced discriminator, using an FM signal as its input, produces a demodulated baseband signal as its output. (CO2)	03+06
3. (b)	Prove that, the output of a P-N diode modulator is a conventional DSB-AM modulated version of its input message signal. (CO2)	07

OR

- |        |  |       |
|--------|--|-------|
| 3. (b) | What are the practical constraints in demodulating SSB AM signals? Why SSB AM is so popular in voice communication? Why is conventional DSB AM so popular in AM radio broadcasting?<br>(CO2)   | 07    |
| 4.     | Write short notes on <i>any two</i> of the following:<br>(i) Twisted pair telephone channel based communication channels.<br>(ii) Power spectral density of a stationary random process.<br>(iii) Characteristic features of white noise.<br>(CO1) | 05+05 |

**B.E. ELECTRICAL ENGINEERING FOURTH YEAR FIRST  
SEMESTER EXAMINATION 2024**

**Principles of Communication Engineering and Computer Networks (HONS.)**

**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) Discuss the reasons for flow integrity error in data bits during transmission across the network. (CO3) 4
- b) Find the checksum of the following four binary numbers each having 16 bits. The MSBs are on the left hand of each byte. 4  
 1011001110101011, 0101101011010101, 1110011001100110 and 1101010101010101.  
 How checksum is used to detect error in data transmission? What are the limitations of the checksum method? (CO3)
- c) Show the waveform of the digital signal to be transmitted using (i) Manchester and (ii) Bipolar AMI encoding techniques for the digital data 1101111010. Mention the merits of both the techniques. (CO3) 4

**OR**

1. a) Calculate the frame check sequence (FCS) for the message M = 11100011 by CRC method using generator polynomial P = 110011. Show the actual bit stream transmitted. 2.5+1+2.5  
 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)
- b) Why are the wires twisted in twisted pair cable? What is the difference between UTP and STP cables? (CO3) 2+2
- c) What is differential encoding and also explain the difference between NRZL and NRZ-I encoding schemes. (CO3) 2

[ Turn over

2. a) Why layered approach is needed in protocol architecture model? (CO2) 3
  - b) Explain the functions of data link layer, network layer and presentation layer of ISO/OSI architectural model. (CO2) 5
- OR
2. a) What is channel capacity? How the channel capacity can be determined for noisy and noiseless channel? (CO1) 3+2
  - b) Calculate the data rate for a channel having bandwidth 1600hz, if S/N ratio is 30db. (CO1) 3
3. a) Explain the virtual circuit service and datagram service in packet switched wide area network. Compare the two services in terms of quality of service, reliability of service and implementation complexity. (CO4) 6
  - b) Briefly explain the following terms in context with LAN: (CO4) 3  
10Broad36, 100Base-T, 100Base-F
  - d) Explain the reasons for different types delays in circuit switched network. Give one Example of circuit switched network. (CO4) 3
- OR
3. a) What are hidden station and exposed station problems? How do RTS and CTS help to solve the problems of hidden and exposed station? (CO4) 4
  - b) Briefly explain the TOKEN RING protocol for LAN. How its performance can be improved? (CO4) 4
  - c) Why DSSS (Direct Sequence Spread Spectrum) technology is used as physical layer in IEEE 802.11 wireless LAN? (CO4) 4
4. a) How the congestion in the network can be detected? (CO5) 6
- The TCP congestion window is at 24 Kbytes and triple duplicate ACK occurs, then what Will be the window size and threshold (slow start threshold(ssthresh)) size? Explain with diagram the procedure to overcome this situation of congestion. (CO5)
- b) Explain the two types of virtual connection in an ATM network. (CO5) 3
  - c) Mention the necessity of "TTL" (Time-to-live) and "TOS" (Type of Service) field in the IP datagram header (IPv4) format. (CO5) 3
  - d) Find the shortest distance from source node a to all other nodes and hence the shortest distance between node a to node h using Dijkstra's Algorithm shown in Fig.1 (CO5) 6

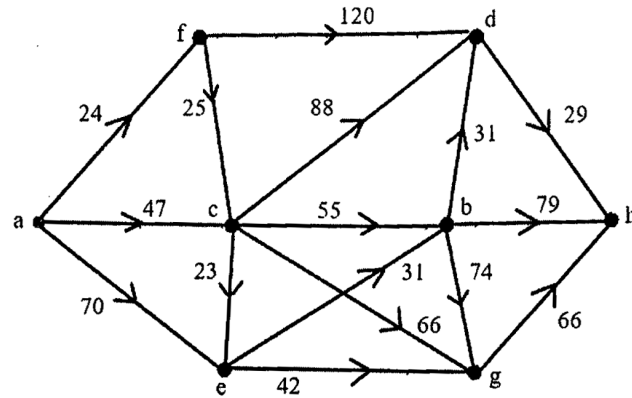


Fig.1

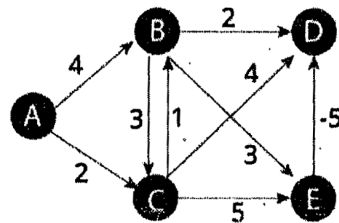
OR

4. a) Explain "Selective Repeat" flow control protocol. (CO5)

4+3

The frame size is 2400 bits on a satellite channel operating at 4800 bps(bit/sec). What is the link utilization efficiency for stop-and-wait flow control mechanism? The distance between the sender and receiver is 2000km and speed of propagation over the medium is 200,000km/sec.

- b) 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)



- c) What is committed information rate (CIR) and excess burst size (Be) in Frame Relay network? (CO5)

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