CLASS:	BE	SEMESTER : V
BRANCH:	ECE	SESSION : MO/19

SUBJECT: EC5205 DATA COMMUNICATION

TIME: 3 HOURS   FULL MARKS: 60

INSTRUCTIONS:
1. **The question paper contains 7 questions each of 12 marks and total 84 marks.**
2. **Candidates may attempt any 5 questions maximum of 60 marks.**
3. **The missing data, if any, may be assumed suitably.**
4. **Before attempting the question paper, be sure that you have got the correct question paper.**
5. **Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.**

Q.1(a)   What is meant by Intermodulation Noise? How is it caused?   [2]

Q.1(b)   Compare the philosophical differences between TCP/IP Protocol suite and OSI Layered architecture.   [4]

Q.1(c)   What is meant by E_b/N_o ratio? What is its significance? What is the effect of signal strength and data rate on E_b/N_o ratio?   [6]
If the received signal level for a particular digital system is -151 dBW and the receiver system effective noise temperature is 1500^0 K, what is E_b/N_o ratio for a link transmitting at a rate of 2400 bps?

Q.2(a)   What are the advantages of encoding digital data into digital signals?   [2]

Q.2(b)   What do you understand by Bandwidth efficiency? How does the Multi-level signaling improve the Bandwidth efficiency?   [4]

Q.2(C)   Explain the Delta Modulation (DM) scheme with relevant block diagram and input-output signal waveforms. Why the selection of the step-size is critical in DM scheme?   [6]

Q.3(a)   What is meant by Hamming distance? What is its significance in Error detection schemes?   [2]

Q.3(b)   What is meant by a Null Modem? Why is it required? Justify all connections of Null Modem.   [4]

Q.3(c)   For a frame 1011000110110100101 received at the receiver, check whether there is any error in the frame using C.R.C. scheme, if the Generator polynomial P(x) is $x^5 + x^4 + x^3 + x +1$. What is the original message, if there is no error? Also mention the number of shift registers and exclusive-OR gates required for the hardware implementation of the same.   [6]

Q.4(a)   List out the different protocols used by Point-to-Point (PPP) protocol during Connection establishment and termination, Authentication, Networking and Data transfer phases.   [2]

Q.4(b)   A sliding window protocol scheme adopts a 3-bit sequence number. At one stage, frames 0, 1 and 2 are sent and the transmitter has received ACK 2. The transmitter again sends frames 3 and 4. There is an error in frame 3 and the receiver sends NAK 3, which is lost on the way. List out the sequence number of the frames which can be transmitted before the transmitter receives any further ACKs or NAKs, in the following cases due to this error.   [4]
i) In Go-back to N ARQ, the transmitter times out.
ii) In Go-back to N ARQ, the transmitter does not time out.
iii) In Selective Reject ARQ, the transmitter times out.
iv) In Selective Reject ARQ, the transmitter does not time out.

Q.4(c)   What is meant by Data Transparency Control in HDLC protocol? Why it is needed? How it is achieved? A frame to be sent is given below:-   [6]
011111100111111001110111110111111101111111001111110. What will be the transmitted frame? Also, highlight the bits stuffed in the frame.

Q.5(a)   What do you understand by Discrete Multitone (DMT) technology used in ADSL? How the bits are allocated per channel in DMT?   [2]

Q.5(b)   Compare Synchronous and Asynchronous TDM schemes for N number of sources in terms of bandwidth efficiency, number of time slots on the TDM frame, data rate of the multiplexed line, complexity and the buffer requirement to support high traffic load.   [4]

Q.5(c)   The following 16 sources are to be multiplexed to obtain a synchronous TDM scheme with a data rate of 246 Kbps: [6]
- Analog 1.5 KHz bandwidth.
- Analog 3 KHz bandwidth.
- Analog 4.5 KHz bandwidth.
- Analog 6.0 KHz bandwidth.
- 3 Digital sources of 8100 bps synchronous.
- 4 Digital sources of 5400 bps synchronous.
- 5 Digital sources of 2700 bps synchronous.

Implement the scheme as a block diagram, showing all relevant details.

Q.6(a) When does a blocking condition occur in a two-stage (TS) digital switch? How this eventuality is resolved in a TST switch? [2]

Q.6(b) Draw an I/O triangular switch connecting eight stations, and show the connection paths between the stations, if the following stations are communicating each other: 1-7, 2-5, 3-6 and 4-8. [4]

Q.6(c) There are 98 stations to be connected through a Crossbar Matrix switch. What will be the number of cross points required, if a Single stage switch is used? Compare it with the number of cross points required if a 3-stage Non-blocking (optimized) switch is used. What are the advantages of the second switch over the first switch? [6]

Q.7(a) What is meant by Congestion in a Packet switched network? How is it caused? [2]

Q.7(b) The current Routing directory for **Node 2** in ARPANET original version is given in Table 1. The delay vectors received at **Node 2** from the neighboring nodes are given in Table 2. Update **Node 2's** Routing directory based on the delay vectors received. [4]

Destination	Delay	Next Node
1	5	4
2	0	-
3	1	3
4	3	4
5	6	8
6	5	8
7	6	3
8	2	8
9	8	8

Table-1: Node 2's current Routing directory.

From Node '1'	From Node '3'	From Node '4'	From Node '8'
0	2	4	2
4	2	3	3
2	0	2	4
1	3	0	2
2	4	2	2
3	2	1	2
4	5	2	2
1	2	1	0
2	5	1	3

Table -2: Delay vectors received at Node 2.

Q.7(c) Find out the Least cost paths from **Node 9** to all other nodes for the network shown in Figure 1 using Bellman-Ford algorithm and form the **Node 9's** Routing table accordingly. [6]
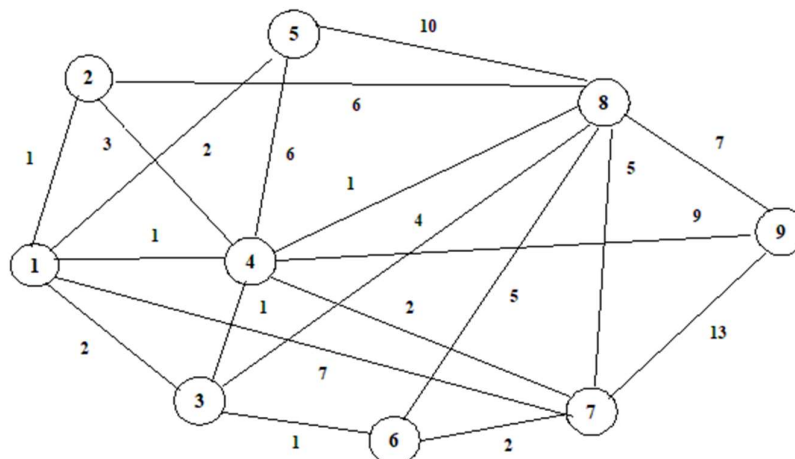
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FIG.1