

**MCA 2nd Semester Examination, 2025**

**MCA**

*( Computer Network )*

**PAPER — MCA-203**

*Full Marks : 100*

*Time : 3 hours*

**Answer all questions**

*The figures in the right hand margin indicate marks*

*Candidates are required to give their answers in  
their own words as far as practicable*

**GROUP—A**

**Answer any five of the following questions :  $2 \times 5$**

- 1. Name the four levels of addresses used in the Internet by TCP/IP protocols. Mention their use.**

*( Turn Over )*

2. What is the minimum required bandwidth of a low-pass channel if we need to send 10 Mbps using baseband transmission ?
3. List the three transmission impairments and suggest their remedies.
4. Define the channel capacity (with appropriate formulae) in noisy and noiseless cases.
5. Assume that a voice channel occupies a bandwidth of 4 kHz. We need to multiplex 12 voice channels with guard bands of 500 Hz using FDM. Calculate the required bandwidth.
6. Name the classes of classful addressing that support unicasting and calculate the total number of network addresses supported.

7. What are the sender and receiver window sizes in case of  
(i) stop and wait,  
(ii) go-back-16 ARQ protocols ?
8. State the Nyquist sampling theorem.

GROUP-B

Answer any four of the following questions :

15 × 4

9. Find out what networks are used at your institute. Describe the network types and topologies. 1 + 6 + 8
10. State the principal reasons for analog modulation of analog signals. Given the data 01001100011, encode it in NRZ-L, NRZ-I, Bipolar, Manchester, and Differential Manchester encoding formats. 5 + 10

11. What are the advantages of fiber optics over copper as a transmission medium? Suppose we want to transmit the message 1011001001001011 and protect it from errors using the CRC8 polynomial  $x^8 + x^2 + x + 1$ . Use polynomial long division to determine the message that should be transmitted. Suppose that the third bit from the left is inverted during transmission. Show that this error is detected at the receiver's end. 3 + 12
12. Compare different multiplexing techniques. Sixteen-bit messages are transmitted using a Hamming code. How many check bits are needed to ensure that the receiver can detect and correct single-bit errors? Show the bit pattern transmitted for the message 1101001100110101. Assume that even parity is used in the Hamming code. 6 + 2 + 7

13. Suppose that a message 1001 1100 1010 0011 is transmitted using Internet Checksum (4-bit word). What is the value of the checksum ? Consider packet sizes are 1000 bits, transmission rate is 1 Mbps, and propagation delay from source to destination is 15 milliseconds. Assume that ACKs are very small, the processing time for packets and ACKs is negligible, and there are no errors in transmission. What will be the throughput if we use :

(a) Stop-and-Wait ARQ.

(b) Go-back-N ARQ, with a window size of 20 packets. 5 + 10

14. What is the need for bit stuffing ? A string, 011110111110111110, needs to be transmitted at the data link layer. What is the string transmitted after bit stuffing ? Draw a figure using the following scenario :

(a) The first frame is sent and acknowledged.

(b) The second frame is sent and acknowledged, but the acknowledgment is lost.

(c) The second frame is resent, but it is timed out.

(d) The second frame is resent and acknowledged.

2 + 3 + 10

15. With neat diagrams, clearly explain the problems encountered in wireless LANs by using simple CSMA protocols for channel allocation. Discuss how those problems are alleviated by using the CSMA/CA protocol. Consider the scenario (placement of stations in the figure) in such a way that at least one station experiences each problem independently, and one station experiences all problems.

7 + 8

16. For each of the following IP addresses,

- (i) Determine the class,
- (ii) Address range of the class in dotted decimal notation
- (iii) Network mask, and
- (iv) Indicate the network and host IDs in dotted decimal form.

11000110001011010100100011100111,  
10111000010000100101110010000101  
and 1101111110100111110000000010111.

3 + 3 + 3 + 6

[ Internal Assessment – 30 Marks ]

