MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY BHOPAL
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

EXAMINATION: MID TERM **MONTH and YEAR: March 2025**

Course: B.Tech	Semester: IV	Subject Code: CSE-224
Subject Name: Data Communication and Networks		Maximum Marks: 20
Duration: 90 mins	Date: 21/03/2025	Time: 9:30 AM to 11:00 AM

Note: Attempt all questions. Assume missing data (if any) and mention the assumptions.

Q. No.	Questions	Marks	COs
1.	A communication channel has a bandwidth of 5 MHz and a signal-to-noise ratio (SNR) of 20 dB. a) Compute the highest data rate for the channel b) Assume Station 'X' needs to send a 10 MB file to Station Y over this channel. Calculate the total latency in sending the file if the distance between X and Y is 15000 km. Given that the signal travels at a speed of $2.4*10^8$ m/s in the channel and that the link has 5 routers each having the cumulative queuing and processing delay as 5 microseconds.	4	CO1
2.	Compare and contrast radio waves, microwaves, and infrared with respect to the following metrics: frequency ranges, propagation characteristics, antenna types used, wall penetration capabilities, achievable data rates. Discuss how these factors influence their suitability for different communication scenarios. Further, highlight the advantages, disadvantages, and typical applications for each of the mentioned waves.	4	CO1
3.	The Return to Zero (RZ) waveform shown in figure is received at receiver end through noisy channel. Because of noisy channel 5th bit get corrupted. Write down the corrupted bit string received and the actual bit sting. 	4	CO2
4.	An audio signal of 300 Hz is to be transmitted using Pulse Code Modulation with sample frequency 50% higher than Nyquist criteria. 8-bit ADC is used after sampling. Calculate the system bit rate. Further, calculate the baud rate in case of NRZ-L, RZ, and AMI line coding schemes.	4	CO2
5.	Encode the "1000000000100001" binary data sequence using the **HDB3 scrambling scheme,** assuming the initial nonzero pulse is **positive (+)** and the scrambling follows **alternate mark inversion (AMI).**	4	CO2

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