

**K. J. Somaiya Institute of Technology, Sion, Mumbai-22**  
(Autonomous College Affiliated to University of Mumbai)

Supplementary Jan-Feb Nov-Dec 2025  
 Program: B. Tech      Scheme: IIB  
 Backlog Examination      TY Semester: V  
 Course Code: **EXC501** and Course Name: **Digital Communication**  
 Date of Exam: ~~26/11/2025~~ 30/01/26      Duration: 02.5 Hours      Max. Marks: 60

Instructions:  
 (1) All questions are compulsory.  
 (2) Draw neat diagrams wherever applicable.  
 (3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any <b>two</b> questions out of three: (05 marks each)	10		
a)	What is the information content of a source symbol with a probability of occurrence of 1/4? If four such symbols are transmitted, what is the total information conveyed?		1	Ap
b)	Differentiate between Forward Error Correction (FEC) and ARQ systems.		2	An
c)	Compare NRZ Polar and NRZ Bipolar (AMI format) line codes with respect to bandwidth, power requirement, and DC level		3	An
Q 2	Solve any <b>two</b> questions out of three: (05 marks each)	10		
a)	A baseband signal has a bandwidth of $W = 5$ kHz. Calculate the maximum bit rate that can be transmitted without ISI.		4	Ap
b)	Explain the concept of Error probability in the context of optimum baseband detection.		5	U
c)	Compare the Bandwidth requirement of Binary ASK and Binary FSK modulation.		6	An
Q.3	Solve any <b>two</b> questions out of three. (10 marks each)	20		
a)	Design the Shannon-Fano code for the following symbols: $A = \{a_1, a_2, a_3, a_4, a_5\}$ with probabilities $P = \{0.3, 0.25, 0.2, 0.15, 0.1\}$ . Calculate the average codeword length.		1	Ap
b)	Explain the working of Stop-and-Wait ARQ and Go-Back-N ARQ systems. Compare them based on efficiency and complexity.		2	An

Seat No.:

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	c) A Convolutional Encoder is defined by $G1 = [1, 0, 1]$ and $G2 = [1, 1, 1]$ . (a) Draw the State Diagram and Trellis Diagram for this encoder. (b) If the input message sequence is 1011, find the output codeword using the Trellis Diagram.		3	Ap
Q.4	Solve any <b>two</b> questions out of three. (10 marks each)	20		
a)	Draw the block diagram of a typical Baseband Transmitter-Receiver System. Explain the role of the Transmitting Filter and the Equalizer (not explicitly named, but implied in distortion less transmission).		4	Un
b)	Explain the working and principle of the Matched Filter Receiver with a neat block diagram. Discuss how it achieves optimum detection.		5	U
c)	With the help of a block diagram, explain the Generation and Coherent Detection of Quadrature PSK (QPSK). Derive the expression for its spectral efficiency.		6	Ap

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