



Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.:

SCHOOL OF ELECTRONICS ENGINEERING (SENSE)
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2024-2025

SLOT: C2

Programme Name & Branch : B. Tech ECE
Course Code and Course Name : BECE306L – Digital Communication System
Faculty Name(s) : Dr VELMURUGAN T, Dr SARAVANAN K, Dr DILIP KUMAR
CHOUDHARY, Dr NANDAKUMAR S, Dr MUGELAN R K
Class Number(s) : VL2024250102831, VL2024250102833,
VL2024250102826, VL2024250102819, VL2024250102827
Date of Examination : 15-10-2024
Exam Duration : 90 minutes
Maximum Marks: 50

- **General instruction(s):** Error function table to be permitted
- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes
 - (CO2) Analyse the performance of various waveform and Line coding techniques.
 - (CO5) Examine the BER and bandwidth efficiency of the Bandpass modulation techniques.

Q. No	Question	M	CO	BL
1.	In biphase baseband signalling, binary symbol 1 is represented by the doublet pulse $s(t)$ of duration T_b and binary symbol 0 is represented by the negative of this pulse. Derive the power spectral density of biphase format.	10	2	2
2.	Four signals $S_1(t), S_2(t), S_3(t)$ and $S_4(t)$ are shown below. Using Gram-Schmidt orthogonalization procedure find the orthonormal basis function. $S_1(t) = 2 \quad (0 \leq t \leq 1)$ $S_2(t) = \begin{cases} -2 & (0 \leq t \leq 1) \\ 1 & (1 \leq t \leq 3) \end{cases}$ $S_3(t) = \begin{cases} 1 & (0 \leq t \leq 1) \\ -1 & (1 \leq t \leq 2) \\ 1 & (2 \leq t \leq 3) \\ -1 & (3 \leq t \leq 4) \end{cases}$ $S_4(t) = \begin{cases} 1 & (0 \leq t \leq 1) \\ -2 & (1 \leq t \leq 3) \\ 2 & (3 \leq t \leq 4) \end{cases}$	10	5	3
3.	a) Suppose that coherent binary PSK is used for transmitting information over an AWGN with power spectral density of $2 \times 10^{-10} \text{ W/Hz}$. It is desired to have an average probability of error $P_e \leq 10^{-5}$ and an average carrier power is $2.24 \times 10^{-4} \text{ W}$. Determine the data rate of the system. b) Determine the message points associated with band pass BASK system and draw the signal space diagram.	6 4	5	3
4.	a) A stream of binary bits is transmitted using ON-OFF signalling scheme with voltage levels 0 and 2 volts. The ON-OFF signal is transmitted over an AWGN channel with zero mean and unit variance. If the receiver receives anything above 1 V, it was assumed that '1' was sent else '0' was sent. If the sender transmits 1000 binary bits, then determine how many bits are detected correctly. b) Derive an expression for the conditional probability of the receiver deciding in favour of symbol 0, given that the symbol 1 was transmitted for coherent binary ON OFF Keying system.	5 5	5	3



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5.	a) A quadrature signalling scheme modulates phase of the carrier based on the incoming Gray coded dibits. Identify the signalling scheme used. Find the message signal points and draw the constellation diagram.	5	5	3
	b) Binary data are transmitted at a rate of 10^6 bit per second over a microwave link. Assuming channel noise is AWGN with zero mean and power spectral density at the receiver input is 10^{-10} Watts per Hz, find the average carrier power required to maintain an average probability of error $P_e \leq 10^{-4}$ for coherent binary Phase signalling scheme, where the two possible transmitted signals are orthogonal to each other. Determine the minimum channel bandwidth required.	5		
