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Roll no. _____

B.Tech. III Semester (CSE/CSAI/CSDS)

MID-SEMESTER EXAMINATION, FEBRUARY 2024

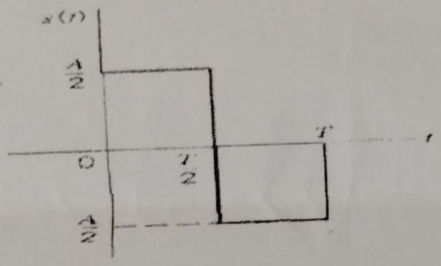
Course Code: COECC12/CAECC12/ CDECC12

Course Title: DATA COMMUNICATION

Time: 1:30 Hours

Max. Marks: 15

Note: Attempt all Questions.
Missing data/information (if any), may be suitably assumed and mentioned in the answer.

Q.No.	Question	Marks	CO
1	(a) Given the periodic signal $x(t) = t^2$, $0 < t < 1$. Determine the exponential Fourier series. (b) Plot the magnitude spectrum of the above signal.	2+1	CO1
2	(a) Find the Fourier Transform of the signal s(t)  (b) Find the Fourier Transform of x(t)=S(2t+2)	2+1	CO1
3	(a) Given the signal $x(t) = 10cos(2000\pi t)cos(8000\pi t)$. What is the minimum sampling rate. (b) What is Aliasing effect and how can it be minimized?	2+1	CO1
4	(a) Derive the expression for SNR (dB) of a uniform quantizer if the input signal is sinusoidal in nature. (b) Consider the functions $\phi_1(t) = e^{-\lvert t\rvert}$ and $\phi_2(t) = 1 - Ae^{-2\lvert t\rvert}$. Determine the constant A such that $\phi_1(t)$ and $\phi_2(t)$ are orthogonal over the time interval $(-\infty, \infty)$.	2+1	CO1
5	Given a (6, 3) linear block code with the following parity check matrix **H** $H = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$ (1) Find **G** (2) Find the codeword for the data bit 101.	2+1	CO2

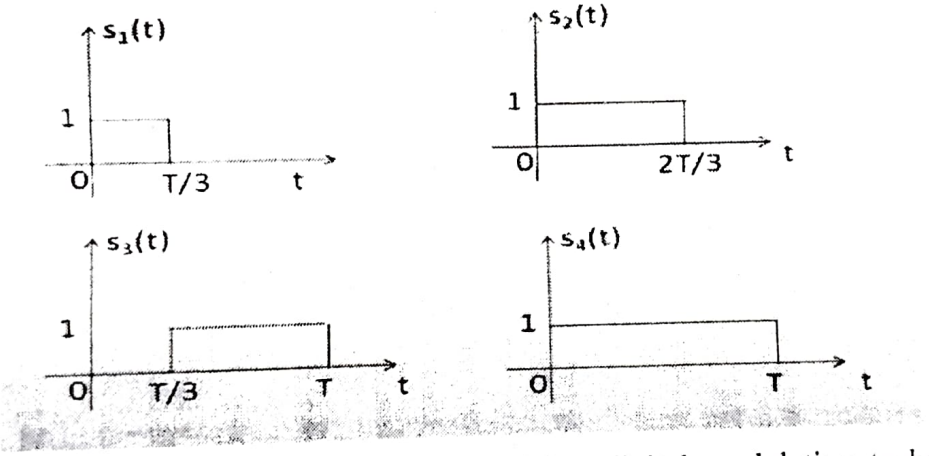
END-SEMESTER EXAMINATION, APRIL 2024

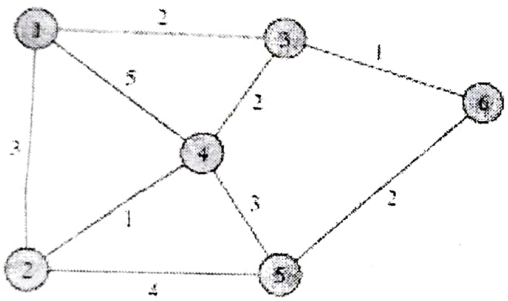
Course Code: COECC12/CAECC12/ CDECC12

Course Title: DATA COMMUNICATION

Time: 3:00 Hours | Max. Marks: 40

Note: Missing data/information (if any), may be suitably assumed and mentioned in the answer.

Q.No.	Question	Marks	CO
1	**Attempt any TWO parts**		
	(a) Explain in detail Instantaneous sampling. Find the Nyquist sampling rate for the m(t) = 3sinc(50πt)sinc(100πt).	4	CO1
	(b) Using the Gram-Schmidt orthogonalization procedure, find a set of orthonormal basis functions to represent the four signals s1(t), s2(t), s3(t) and s4(t) shown in Fig. 	4	CO1
	(c) Consider a numerical example involving digital modulation techniques, specifically Binary Phase Shift Keying (BPSK). Suppose we have a binary input signal m(t)consisting of a sequence of bits:m(t)={0,1,0,1,1,0,1,0}. Represent the modulated signal and sketch it. Also draw the modulator and demodulator of BPSK.	4	CO1
2	**Attempt any TWO parts**		
	(a) Explain the ISO-OSI model and briefly state the role of each layer.	4	CO1
	(b) Discuss the different types of transmission media along with their properties, advantages, disadvantages and applications.	4	CO2
	(c) The received CRC code bits are [110011100110]. The generator polynomial is $g(x) = x^4+x^3+1$. Find whether the received code word is correct or not.	4	CO2

3	**Attempt any TWO parts** (a) A channel with 50 kbps data rate and a propagation delay of 2 ms follows Stop-and-Wait ARQ protocol. Determine the minimum frame length to achieve a link efficiency of at least 45% if the probability of error is P=0.1.	4	CO4
	(b) Explain the control field of the HDLC frame format. According to this format, what is the maximum window size for the Selective Repeat ARQ protocol ?	4	CO4
	(c) Explain in detail Token Ring and Token Bus. Also differentiate between the two.	4	CO3
4	**Attempt any TWO parts** (a) Suppose that the ALOHA protocol is used to share a 56 kbps satellite channel. Suppose that frames are 1000 bits long. Find the maximum throughput of the system in frames/second.	4	CO3
	(b) Consider the network in Figure. Use the Dijkstra algorithm to find the set of shortest paths from node 4 to other nodes.  	4	CO3
	(c) Explain the p-persistent method by using suitable algorithm/flow diagram.	4	CO4
5	**Attempt any TWO parts** (a) A railway ticket counter is modeled as an M/M/1 queuing system with an average of 1 new customer arriving every 2 minutes. It is desired to have less than 3 customers line up 99 percent of the time. What should be the service rate for each customer?	4	CO5
	(b) What do you understand by pure birth and death processes? Explain	4	CO5
	(c) Compare the infinite and finite length queuing model with mathematical analysis.	4	CO5