VIT
Vellore Institute of Technology

School of Electronics Engineering
Fall Semester (2024-25)
Continuous Assessment Test - I
BECE306L– Digital Communication Systems

B.Tech ECE | SLOT: C2 | Marks: 50

Q. No	Answer All Questions	Marks
1.	a) Find the Nyquist rate and Nyquist interval for the given signal $x(t) = 6\sin(20\pi t)\cos(10\pi t)$	3
	b) The input signal $s(t)$ is sampled at a rate of 6000 samples per second. The input signal $s(t)$ as follows. $s(t) = \sin(16000\pi t)$ The sampled signal is passed through an ideal low pass filter (LPF) with cutoff frequency of 12 KHz. Determine the LPF output frequency/frequencies and sketch its spectrum.	7
2.	a) An analog to digital converter (ADC) input voltage range between -3 V to 5 V. When we sample the output with an ADC, we need to ensure the maximum quantization error per sample does not exceeds $1\mu V$, then how many bits ADC is required to design the above specification.	5
	b) Derive the signal-to-quantization noise ratio for PCM system using even level quantizer. Assume that input signal is sinusoidal signal.	5
3	The signal $x(t) = 3\sin(2\pi \times 2 \times 10^3 t)$ is sampled at four times the Nyquist rate. Assume the quantization levels are eight. a) Draw the sampled signal diagram with proper specification/scaling. Encode the signal $x(t)$ using differential pulse code modulation (DPCM). Select the quantizer based on mid-riser type. Assume first order linear prediction filter. b) Encode the signal $x(t)$ using delta modulation (DM).	10
4	a) When the input analog signal is sampled at a rate higher than the Nyquist rate, the successive samples become more correlated. Identify a suitable scheme which reduces the redundancy in the transmitted PCM signal. Develop the building blocks for the transmitter and receiver.	5
	b) Let the message signal $x(t)$ be the input to delta modulator (DM). The message signal $x(t)$ as follows. $x(t) = 10\sin(4\pi \times 10^3 t) + 8\sin(6\pi \times 10^3 t)$ Find the minimum sampling rate that will prevent slope overload distortion. Assume the step size is 0.5 V. PTO	5

5	For the given binary data b_k, sketch the following line coding format. $b_k = \{1, 0, 1, 0, 0, 1, 0, 1, 0, 1\}$ (i) ON OFF NRZ. (ii) Polar NRZ. (iii) Pseudoternary signalling RZ. (iv) AMI NRZ. (v) Doublet Pulse format.	10