

**VIT**

Vellore Institute of Technology

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

SCHOOL OF ELECTRONICS ENGINEERING (SENSE)

Fall Semester 2019-20

Continuous Assessment Test – I

ECE4001 – Digital Communication Systems

Duration: 90 minutes

Slot: A1

Max. Marks: 50

Programme: B.Tech ECE

Answer ALL Questions

1.	Assume an analog signal $x(t)$, sampled by a train of impulses at a sampling rate of $f_s = 2f_m$. Derive the expression for the sampled signal in the frequency domain. Draw and explain the spectrum of the sampled signal with $f_s = 2f_m$, $f_s > 2f_m$ and $f_s < 2f_m$.	10
2.	The signal $x(t) = 6 \sin(2\pi t)$ is transmitted using 4-bit binary PCM system. The quantizer is of the midtread type, with a step size of 1 volt. Sketch the resulting PCM output waveform (Unipolar NRZ) for one complete cycle of the input. Assume a sampling rate of four samples per second, with samples taken at $t = \pm 1/8, \pm 3/8, \pm 5/8, \dots$ seconds.	10
3.	A band-limited signal $m(t)$ of 3 kHz bandwidth is sampled at rate of 33% % higher than the Nyquist rate. The maximum allowable error in the sample amplitude (i.e., the maximum quantization error) is 0.5% of the peak amplitude m_p . Assume PCM binary encoding. Find the minimum bandwidth of the channel to transmit the encoded binary signal.	10
4.	In a single integration DM scheme, the voice signal bandwidth of 3.5 kHz is sampled at a rate of 64 kHz. The maximum signal amplitude is 1 Volt and f_o is 3.5 kHz. a. Determine the minimum value of step size to avoid slope overload. b. Determine granular noise power, if the voice signal bandwidth is 3.5 kHz. c. Assuming signal to be sinusoidal, calculate signal power and signal to noise ratio. d. Assuming that noise signal amplitude is uniformly distributed in the range $(-1, +1)$ determine the signal power and signal to noise ratio.	10
5.	Draw the following formats for the given binary sequence (11011000) (a). Unipolar NRZ and RZ (b). Bipolar NRZ and RZ (c). Polar Quaternary format (Natural – Encoded) (d). Differential Encoding format.	10