Total No. of Questions : 6] **SEAT No. :**

P5023 **[Total No. of Pages : 2**

TE / Insem - 521

T.E. (E& Tc)

DIGITAL COMMUNICATION

(2012 Pattern) (Semester - I)

Time : 1 Hour] ***[Max. Marks :30***

Instructions to the candidates:

1) ***Q.1, or Q.2, Q.3 or Q.4, Q.5 or Q.6 .***
2) ***All question carry equal Marks.***

Q1) a) A signal m (t) band - limited to 3kHz is sampled at a rate $33\frac{1}{3}\%$ higher than the Nyquist rate. The maximum acceptable error in the sample amplitude (the max. quantization error) is 1% of peak amplitude m_p. The quantized samples are binary coded. Find the minimum bandwidth of a channel required to transmit the encoded binary signal. If 24 such signal are time - division multiplexed, determine the minimum transmission bandwidth required to transmit the multiplexed signal. **[5]**

b) Draw neat block diagram of TDM-PCM system and Explain. **[5]**

OR

Q2) a) Derive the expression for signal to quantization noise ratio for PCM system that employs linear quantization technique. Assume that input to the PCM system is a sinusoidal signal. **[5]**

b) What is need of synchronization in digital communication. **[5]**

Q3) a) A random signal $Y(t) = A\,X(t)\cos(2\pi fct + \varphi)$ Where X (t) is a stationary process with zero mean. φ is the random variable distributed uniformly over $[0, 2\pi]$. Assuming X (t) and φ are independent. find and Draw PSD of Y (t). **[5]**

b) Explain Inter symbol interference. Explain its causes and remedies to avoid it. **[5]**

OR

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Q4) a) Explain AT & T multiplexing Hierarchy system **[5]**

b) The random variable X has a uniform distribution over a $0 <= x <= 2$ find mean and mean square value for the random process $V(t) = 6e^{xt}$. **[5]**

Q5) a) What is random process? Explain Ergodic Process. **[5]**

b) A signal m (t) of bandwidth B = 4kHz is transmitted using a binary companded PCM with $\mu = 100$. Calculate transmission bandwidth and output SNR for 256 quantization levels. **[5]**

OR

Q6) a) Explain Speech synthesis using LPC. **[5]**

b) Derive the relation between Mean of input and output random process when a weak sense random process X(t) passing through LTI system having impulse response h (t) generate output random process Y(t). **[5]**