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]**

<div align="center">OR</div>

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]**

<div align="center">OR</div>

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]**

<div align="center">OR</div>

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]**

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