Total No. of Questions – [4] Total No. of Printed Pages 2

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T. Y. B. TECH. (E & TC) (SEMESTER - I)

COURSE NAME: Communication Engineering-II

COURSE CODE: ETUA31173

(PATTERN 2017)

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

(*) Instructions to candidates:

1) **Answer Q.1 OR Q.2 and Q.3 OR Q.4.**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1) a) Explain Gram-Schmidt procedure to generate orthogonal set of functions. Derive for two components, u1 and u2 only. Use this procedure and find the orthonormal functions for the signal shown in the Figure 1. **[6 marks]**

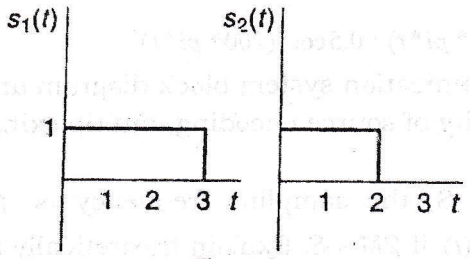

Figure 1

b) What is the importance to study random process in communication? Explain the classification of random process. **[6 marks]**

c) Find out the cross-correlation of the signals shown in the figure 2.**[4 marks]**

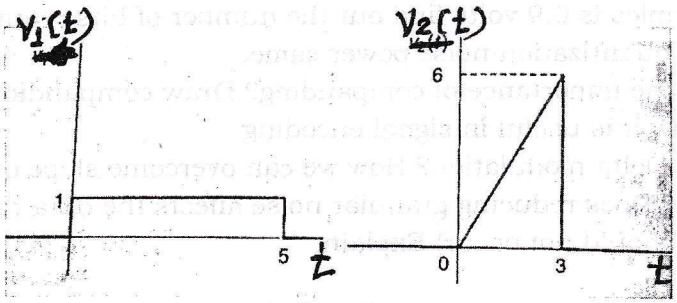

Figure 2

OR

Q.2) a) A waveform *m(t)* has a Fourier transform *M(f)* whose magnitude is as shown in the figure 3. Find the normalized energy content of the waveform. Calculate the frequency *f1* such that one-half of the normalized energy is in the frequency range *–f1* to *f1*. **[6 marks]**

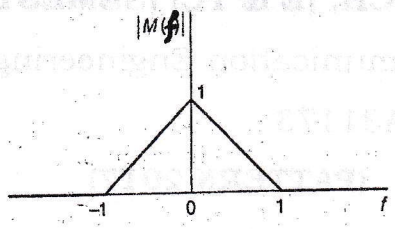

Figure 3

b) Explain power spectral density? What is the importance of PSD in communication? Explain the relation between input and output PSD if the signal is passed through the channel whose impulse response is *h(t)*. **[6 marks]**

c) A voltage gain of 0.1 is produced by an attenuator. What is the gain in Decibels? What is the power gain (not in Decibels) **[4 marks]**

Q.3) a) Find out the sampling frequency required to avoid aliasing. Draw the spectrum of the sampled signal. If the signal is sampled with sampling frequency equal to (0.75*fs), then draw the spectrum and find out the allies frequency components.

$$x(t) = 0.7\cos(100 * pi * t) + 0.5\cos^2(200 * pi * t)$$ **[6 marks]**

b) Draw digital communication system block diagram and write the importance and functionality of source encoding, multiplexing and line coding block in brief. **[4 marks]**

c) If the step size is S, the sampling frequency is f_s and $x(t) = M\sin(\omega_0 t)$, explain what happens to $\hat{x}(t)$ if $2M < S$. Explain theoretically and graphically **[4 marks]**

OR

Q.4) a) A signal varying in the range of 0 to 5 volts amplitude with 3.5 kHz bandwidth is encoded using 8 bit PCM. Compute data rate and quantization noise power. If same signal is encoded using DPCM where max difference between successive samples is 0.9 volts find out the number of bits required to encode the signal keeping quantization noise power same. **[6 marks]**

b) What is the importance of companding? Draw companding characteristics and explain how it is useful in signal encoding. **[4 marks]**

c) Explain Delta modulation? How we can overcome slope overload error and granular noise? Does reducing granular noise affects the data rate? (Consider slope overload error should not occur) Explain. **[4 marks]**

========== **END** ==========