Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

PCEC 4302

Fifth Semester Back Examination – 2014

ANALOG COMMUNICATION TECHNIQUES

BRANCH(S) : EC, ETC

QUESTION CODE : L 230

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) When two signals are said to be orthogonal ? Give an example.

   (b) State and prove the modulation theorem of Fourier transform.

   (c) Can you apply Dirichlet's conditions to a unit step function ? Justify.

   (d) State two salient features of DSB with carrier type of communication system.

   (e) Why is the superheterodyne receiver used ?

   (f) Prove Parsevals' theorem.

   (g) When an FM signal is said to be an NBFM signal ?

   (h) Is analog phase modulation used in practice ? Justify.

   (i) What is SNR ? Give its numerical value if it is 35 dB.

   (j) State the working principle of a slope detector.

2. (a) Find the time domain signal corresponding to $U(-f)$ where $U(.)$ is a unit step function in the frequency domain. Explain the property of Fourier transform that you might have used here. 5

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(b) Give the spectrum of a triangular pulse train given as $\left(1-\frac{|t|}{\tau}\right)$ with a period of T. 5

3. (a) Evaluate and sketch the convolution of a unit amplitude rectangular pulse of duration T seconds with itself. What is your observation from this result ? 5

(b) A signal $m(t) = \cos 200\pi t$ is sampled at a frequency of $f_s = 3000$ Hz. Sketch the spectrum of the sampled signal. Can you recover the original signal from its samples ? 5

4. Compute the mean and variance of a Gaussian random variable given as 10

$$p(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x-m)^2}{2\sigma^2}\right).$$

5. (a) Draw and explain a ratio detector circuit. 5

(b) Discuss the role of pre emphasis and de emphasis. Derive the transfer functions of these two circuits. 5

6. (a) Find out the power content of a DSB with full carrier kind of modulated signal for an arbitrary modulating signal m(t). What does this result become when $m(t) = \cos 200\pi t$? 6

(b) Give two different realizations of a ring type modulator. Compare the two circuits. 4

7. (a) Discuss suitable circuits for generating PWM signals with appropriate waveforms at each stage. 6

(b) Explain a sample and hold circuit and its application. 4

8 Write short notes on any **two** of the following : 5×2

(a) Noise equivalent bandwidth

(b) VSB and its applications

(c) White noise as a random process

(d) Ensemble average of random variables.
