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

Total number of printed pages – 2

B. Tech

PCEI 4301

Fifth Semester Back Examination – 2014

COMMUNICATION SYSTEM ENGINEERING

BRANCH(S) : AEIE, BIOMED, EIE, IEE

QUESTION CODE : L 231

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) Is AM a linear system ? Justify.

   (b) What is a reconstruction filter ? Give its impulse response.

   (c) Calculate the modulation index when a tone of 2V peak-to-peak amplitude modulates a 3V carrier. Sketch the modulated signal.

   (d) What are the factors that determine thermal noise ? What noise you would obtain when you switch off the receiver ?

   (e) Why frequency translation is performed ? Is it carried out at the transmitter, channel or the receiver ?

   (f) Sketch the spectrum when a periodic triangular wave of peak-to-peak amplitude of 1 V amplitude modulates a 2 V carrier.

   (g) Write down an expression for a phase modulated signal. Give its modulation index as well as its unit.

   (h) State one advantage and one disadvantage of FM.

   (i) Sketch the spectrum of a 100 Hz sinusoid when it is sampled at a rate of 150 Hz.

   (j) What is the performance index of a typical analog communication system ? Justify.

2. (a) Discuss the process of signal recovery from its samples. Justify your answer by deriving appropriate mathematical expressions. 5

(b) Derive the SQNR when an analog signal having a dynamic range of 10V is quantized with 256 levels. How do you binary represent the extreme amplitudes of such a signal ?

Can you apply companding when a compander is given by a transfer characteristic $v_0 = av_1$ where $|\alpha| \geq 1$? Justify. 5

3. (a) Derive the spectrum of an arbitrary signal when it is sampled by a pulse train of unit amplitude and period T seconds. How can you recover the original signal from its samples at the receiver ? 5

(b) Let W be arbitrary and x(t) be a lowpass signal with bandwidth W. Show that the set of signals $\{\phi_n(t)\}_{n=-\infty}^{\infty}$ where $\phi_n(t) = \sin c(2Wt - n)$ represents an orthogonal signal set. 5

4. Derive the spectrum of a raised cosine pulse. How is it useful in a communication system ? 10

5. (a) Suggest suitable circuits for a transmitter and corresponding receiver for sending data by delta modulation. 5

(b) Compare PCM and DPCM. 5

6. (a) Discuss Armstrong's method of WBFM generation with appropriate block schematics. What is wide in WBFM ? 5

(b) Discuss the principle and working of a Foster-Seeley discriminator with the help of appropriate circuit diagrams. 5

7. (a) Derive the expression for an USSB modulated signal. Suggest a suitable transmitter for this. 5

(b) Prove that multiplication in time domain is equivalent to convolution in frequency domain. 5

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

(a) Quantization noise in delta modulation

(b) Pre emphasis and deemphasis

(c) Parseval's theorem

(d) PWM and PPM systems