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

Total number of printed pages – 3

B.Tech

PCEE 4304

Sixth Semester Examination – 2013

COMMUNICATION ENGINEERING

BRANCH : EEE

QUESTION CODE : A 171

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) Give an example each of a time limited and a band limited signal. Sketch these.

(b) Give the spectrum of sinc $(f_1 t)$.

(c) Give the spectrum of $e^{at}\, u(-t)$.

(d) What is Y(f) if y(t) = x(2 – t) ?

(e) Two continuous-time LTI systems, each with an impulse response function $h(t) = \frac{\sin(at)}{at}$ are connected in cascade. Give the impulse response function of this cascaded system.

(f) What are the conditions that should be met to ensure a distortion free reception ?

(g) Cite two differences between an AM signal and a NBFM signal.

P.T.O.

(h) Would you recommend SSB-SC as a modulation scheme for audio broadcasting ? Justify.

(i) Give two advantages of a DM system.

(j) Differentiate between a DM and a DPCM system.

2. (a) Find the Fourier transform of a signal given as $x(t) = \begin{cases} \cos \pi t : -\frac{1}{2} \le t \le \frac{1}{2} \\ 0 \qquad \text{otherwise} \end{cases}$ 5

(b) Find the Fourier transform of $x(t) = \left(\frac{1}{1+t^2}\right)$. 5

3. (a) Find the Fourier transform of 5

(i) $x(t) = \exp(-3t)\, u(t-2)$ and

(ii) $x(t) = 2t\exp(-2t)u(t)$

(b) Compute the energy contained in the signal $x(t) = 4\text{sinc}\, 40t$. 5

4. (a) Given a signal $x(t) = A\,\Pi\left(\frac{t}{T}\right)\cos(\omega_c t + \theta)$, find 5

(i) its analytic signal,

(ii) spectrum of the analytic signal and the

(iii) complex envelope

(b) Express the signal $x(t) = 2 + \sin \omega_0 t - 3\cos(\omega_0 t + {}^{\pi}/_{4}) + 2\cos 2\omega_0 t$ as the sum of complex exponentials and plot the magnitude spectrum. 5

5. (a) A signal $x(t) = \cos(1000\pi t + 2\cos 2000\pi t)$ DSB-SC modulates the carrier $c(t) = 50\cos 2\pi \times 10^5 t$. Find the expressions for the USSB-SC and LSSB-SC components of the modulated signal and sketch their spectra. 5

(b) Discuss quadrature amplitude multiplexing. 5

6. (a) A particular signal is given by $x_c(t) = 2\cos \omega_c t + 0.4 \cos \omega_m t \sin \omega_c t$. Comment on the nature/type of modulation. 5

(b) Discuss the quadrature FM detector with the help of appropriate expressions and sketches. 5

7. (a) Elucidate the companding process. Would you apply it to a sinusoid of peak-to-peak amplitude of 5V ? Justify. 5

(b) Establish the relationship between the SQNR and the number of bits used to represent a given sample. 5

8. (a) Discuss any two line codes. Place your comparisons in a tabular format justifying your answers in each step. 5

(b) Discuss a typical monochrome TV receiver with the help of a neat sketch. 5