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BIEL-014

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

00326

June, 2015

BIEL-014 : ANALOG COMMUNICATION

ime : 3 hours *Maximum Marks : 70*

ote : *Answer any* ***seven*** *questions. All questions carry equal marks. Assume missing data, if any. Use of scientific calculator is allowed.*

(a) Explain variance and standard deviation of a random variable. 5

(b) Find the cross co-relation between the two given functions : 5

$$x(t) = P_1 \cos \omega_0 t$$

$$y(t) = P_2 \sin \omega_0 t$$

(a) Explain how frequency modulation may be obtained from a phase modulator. 5

(b) Find the total modulated power, sideband power and net modulation index for the AM signal given by the following expression s(t) : 5

$$s(t) = 10 \cos (2\pi * 10^6 t) +$$

$$5 \cos (2\pi * 10^6 t) \cos (2\pi * 10^3 t) +$$

$$2 \cos (2\pi * 10^6 t) \cos (4\pi * 10^3 t)$$

3. (a) A single tone modulating signal $f(t) = E_m \cos(\omega_m t)$ is used to generate a VSB signal.

$$s(t) = \frac{1}{2} a E_m E_c \cos(\omega_c + \omega_m) t + \frac{1}{2} E_m E_c (1 - a) \cos(\omega_c - \omega_m) t$$

where a is a constant less than unity, representing the attenuation of upper side frequency.

(i) Find the quadrature component of VSB signal s(t).

(ii) The VSB signal, plus the carrier $E_c \cos \omega_c t$ is passed through an Envelope detector. Determine the distortion produced by the quadrature component. *6*

(b) Deduce and compare the figure of merit in the following cases : *4*

(i) Amplitude modulation

(ii) DSB–SC

(iii) SSB

4. (a) Compute the correlation of white Gaussian noise having zero mean and power spectral density of $\frac{N_0}{2}$ with a sinusoidal wave $\sqrt{\frac{2}{T}} \cos(2\pi f_c t)$. *5*

(b) Prove that a narrowband FM signal requires essentially the same transmission bandwidth as that of AM signal. 5

5. (a) Explain with a suitable block diagram for demodulating of DSB–SC signal using Costas receiver. 5

(b) What is meant by diagonal clipping in Envelope detector ? 5

6. (a) Draw and explain the block diagram of Weaver's method for generating SSB modulated waves. 6

(b) What is meant by Pre-emphasis and De-emphasis in FM ? 4

7. (a) What are the non-linear effects in FM system ? 5

(b) Generate an SSB wave using phase discrimination method. 5

8. (a) What are the limitations of Amplitude modulation ? 4

(b) Prove that if a Gaussian process X(t) is applied to a stable linear filter, then the random process Y(t) developed at the output of the filter is also Gaussian. 6

9. (a) State Central limit theorem. *4*

(b) Describe the principle of working of linearised model of phase locked loop and show that the output voltage is proportional to change in frequency in FM signal. *6*

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) Superheterodyne Receiver

(b) Frequency Division Multiplexing

(c) Properties of Hilbert Transform