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BIEL-014

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

Term-End Examination

December, 2015

BIEL-014 : ANALOG COMMUNICATION

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **seven** questions. Assume missing data, if any. Use of scientific calculator is permitted.*

1. (a) Find the time autocorrelation function of the signal $g(t) = e^{-at} u(t)$. 5

(b) List the properties of Gaussian process. 5

2. (a) List the properties of autocorrelation function. 4

(b) Determine the autocorrelation of white Gaussian noise having zero mean and power spectral density of $\frac{N_0}{2}$ when passed through an ideal band-pass filter of pass-band magnitude response equal to one, mid-band frequency f_c and bandwidth 2B. 6

3. (a) Compare DSB-SC, SSB and VSB modulation schemes. *6*

(b) What are the virtues and limitations of amplitude modulation ? *4*

4. (a) Why is quadrature carrier multiplexing scheme called a bandwidth conservation scheme ? Illustrate with the help of suitable block diagram of transmitter and receiver of the quadrature carrier multiplexing system. *6*

(b) Generate

(i) FM wave by using phase modulator, and

(ii) PM wave by using frequency modulator. *4*

5. (a) A single tone modulating signal, $\cos(15\pi * 10^3 t)$ frequency modulates a carrier of 10 MHz and produces a frequency deviation of 75 kHz. Find

(i) Modulation index,

(ii) Phase deviation produced in the FM wave. *6*

(b) With the help of appropriate block diagram, generate a wideband FM signal using indirect method. *4*

6. (a) The maximum deviation allowed in an FM broadcast system is 75 kHz. If the modulating signal is a single tone sinusoid of 10 kHz, find the bandwidth of the FM signal. What will be the change in the bandwidth, if modulating frequency is doubled ? Determine bandwidth when the modulating signal's amplitude is also doubled. *6*

(b) Justify how Ratio detector is better than Foster-Seeley discriminator for FM demodulation. *4*

7. (a) Calculate or show that the figure of merit in case of FM receivers is given by the following expression :

$$FOM = \frac{3k_f^2 P}{W^2}$$

where

k_f = Frequency sensitivity constant

P = Message signal power

W = Bandwidth of message signal *6*

(b) What is meant by 'Capture Effect' in FM system ? *4*

8. (a) What is meant by Pre-emphasis and De-emphasis in FM ? *4*

(b) Discuss how phase locked loop (PLL) may be used to demodulate FM signal. *6*

9. (a) Prove that a narrow band FM signal requires essentially the same transmission bandwidth as that of an AM signal. *5*

(b) Explain square law modulation for AM generation. *5*

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

(a) Weaver's Method for SSB Generation

(b) FM Stereo Multiplexing

(c) Threshold Effect in Envelope Detector