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10EC53

Fifth Semester B.E. Degree Examination, June/July 2017
Analog Communication

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. Define Mean, Correlation and Covariance functions. **(06 Marks)**

b. A random variable has a probability density function

$$f_x(x) = \begin{cases} \frac{5}{4}(1-x^4) , & 0 \le x \le 1 \\ 0 & \text{elsewhere} \end{cases}$$

Find i) E(x) ii) E(4x + 2) and iii) $E(x^2)$. **(06 Marks)**

c. Define Power Spectral Density. Explain the properties of Power Spectral Density. **(08 Marks)**

2 a. Explain the generation of A.M. using a Switching Modulator with equations. **(08 Marks)**

b. A sinusoidal carrier is amplitude modulated by a square wave that has zero DC component and peak – to – peak value of 2V. The period of the square wave is 0.5 rms. The carrier amplitude is 3V(peak) and carrier frequency is 10kHz. Find the modulation index for the modulated wave and sketch all the signals. **(05 Marks)**

c. With the help of a neat diagram, explain the working of costas loop. **(07 Marks)**

3 a. Explain the concept of Pre - envelopes. Obtain the Hilbert Transform of the following function $x(t) = \sin 2\pi ft$. **(07 Marks)**

b. With the block diagram, explain the phase discrimination method of generation of SSB wave consisting of only USB signals. **(07 Marks)**

c. For the AM signal $s(t) = A_c \cos[2\pi f_c t + \phi(t)]m(t)$, find the following :
i) Pre-envelope ii) Complex envelope iii) Natural envelope iv) In-phase – quadrature components. **(06 Marks)**

4 a. Explain the Envelop detection of VSB wave plus carrier with relevant mathematical equations. **(06 Marks)**

b. Show that a VSB of LSB is defined by $s(t) = \frac{Ac}{2} m_I(t) \cos(w_c t) - \frac{Ac}{2} m_Q(t) \sin(w_c t)$. **(06 Marks)**

c. With Spectrum diagram, explain the operation of frequency translation. **(08 Marks)**

PART – B

5 a. Give comparison between Narrowband F.M and Wideband F.M. Define Carson's rule. **(08 Marks)**

b. Explain the generation of wideband F.M using Armstrong method. **(08 Marks)**

c. For a FM wave represented by the voltage equation $V = [12\sin(6 \times 10^8 t + 5 \sin 1250t)]$. Find the carrier modulating frequencies, β and maximum deviation. **(04 Marks)**

6 a. Explain demodulation of FM using phase locked loop non – linear model. **(10 Marks)**

b. With the block diagram, explain the operation of FM stereo multiplexing and stereo demultiplexing concept. **(10 Marks)**

7 a. Explain different types of noise with mathematical equations. **(06 Marks)**

b. Derive Frii's formula for Amplifiers connected in cascade with noisy networks. **(10 Marks)**

c. Calculate the Equivalent Input noise of an amplifier, having a noise figure of 13dB and has a bandwidth of 2 MHz. **(04 Marks)**

8 a. Derive the expression for figure of merit for Noise in AM receivers. **(10 Marks)**

b. Describe the pre – emphasis and de-emphasis in the F.M. **(10 Marks)**

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