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06EC53

Fifth Semester B.E. Degree Examination, June 2012
Analog Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define mean, correlation and covariance functions of a random process x(t). **(06 Marks)**

b. Explain the properties of cross correlation function of two wide–sense stationary process x(t) and y(t). **(08 Marks)**

c. 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]

iii) $E[x^2]$. **(06 Marks)**

2 a. Explain the envelope detection of AM wave, using relevant waveforms and equations. **(07 Marks)**

b. Explain the generation of DSB-SC wave, using balanced –modulator. **(07 Marks)**

c. 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 2.5 V and carrier frequency is 10 KHz. Find the modulation index for the modulated wave. Sketch the modulating, carrier and modulated signals. **(06 Marks)**

3 a. With neat block diagram, write a note on quadrature carrier multiplexing. **(08 Marks)**

b. The output voltage of a transmitter is given by 300 (1 + 0.3 sin 5210 t) sin 2.14×10^7 t. This voltage is fed to a load of 500 Ω resistance. Determine :

i) Carrier frequency

ii) Modulating frequency

iii) Total power output

iv) Carrier power. **(06 Marks)**

c. With frequency spectrum and equations, generate SSBSC wave by using (USB) phase shift method. **(06 Marks)**

4 a. By using time – domain description, derive the equation for the generation of VSB-SC wave. **(06 Marks)**

b. With neat waveforms, explain the concept of up-conversion and down – conversion, using frequency translation. **(08 Marks)**

c. Explain the operation of super – hetero – dyne receiver, with block diagram. **(06 Marks)**

PART – B

5 a. Mention the merits and de – merits of FM system. **(06 Marks)**

b. Explain the generation of FM, using VCO method. **(08 Marks)**

c. The sinusoidal modulating wave $m(t) = A_m \cos w_m t$ is applied to a phase modulators with phase sensitivity kp. The un-modulated carrier wave has a frequency f_C and amplitude A_C. Determine the spectrum of the resulting phase modulated wave assuming that maximum phase deviation $\beta = kp\ A_m$ does not exceed 0.3 radian. **(06 Marks)**

6 a. Explain the detection of FM, using zero – closing technique with necessary waveforms at each stage. **(10 Marks)**

b. With neat block diagram, explain FM stereo – multiplexing. **(10 Marks)**

7 a. Define different types of internal noise with noise equations. **(06 Marks)**

b. Explain noise factors of amplifier in cascade. **(10 Marks)**

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

8 a. Derive the figure of merit of AM receiver and show that its equal to

$$\frac{\mu^2}{2+\mu^2}.$$ **(10 Marks)**

b. Explain the concept of pre-emphasis and de-emphasis in an FM system. **(06 Marks)**

c. The carrier reaching an envelope detector in an AM receiver has an RMS value equal to 1 volt in the absence of modulation. The noise at the input of the envelope detective has a PSD equal to 10^{-3} watts/ Hz. If the carrier is modulated to a depth of 100% and message bandwidth = 3.2 KHz, find $[SWR]_0$. **(04 Marks)**

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