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Fifth Semester B.E. Degree Examination, Dec.2015/Jan.2016

Analog Communication

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1
 - a. Describe mean, correlation and covariance functions with respect to stationary random process. (06 Marks)
 - b. State and discuss central limit theorem. (08 Marks)
 - c. Let X be a continuous random variable having a uniform probability distribution defined in the range $2 \leq x \leq 4$. Let $y = 3X + 2$. Find the means m_x and m_y . (06 Marks)

- 2
 - a. Explain the need for modulation. (06 Marks)
 - b. Describe the generation of AM wave using square law modulator with mathematical analysis. (08 Marks)
 - c. The antenna current of an AM transmitter is 8 amps, when only the carrier is sent. But it increases to 8.93 amps, when the carrier is modulated by a single sine wave. Find the percentage modulation. Determine the antenna, when the percentage modulation changes to 0.8. (06 Marks)

- 3
 - a. What is Hilbert transformation? Derive the expression for impulse response of the Hilbert transformer. (07 Marks)
 - b. Write the canonical representation of band pass signal and derive the expression for time function of SSBSC waveform. (08 Marks)
 - c. Calculate the percentage power saving when the carrier and one of the sidebands are suppressed in an AM wave modulated to a depth of (i) 100% and (ii) 50%. (05 Marks)

- 4
 - a. With neat block diagram, explain the generation of VSB wave by phase discrimination method. (07 Marks)
 - b. Discuss envelope detection of VSB plus carrier. (06 Marks)
 - c. Explain the transmission of a number of independent signals over a single communication channel by modulating different carrier signals. (07 Marks)

PART – B

- 5
 - a. Explain the generation of wide band frequency modulated wave by Armstrong method. (07 Marks)
 - b. A 100 MHz carrier wave has a peak voltage of 5 volts. The carrier is frequency modulated by a sinusoidal modulating waveform of frequency 2 kHz such that the frequency deviation is 75 kHz. The modulated wave form passes through zero and is increasing at time $t = 0$. Write the expression for frequency modulated signal. (05 Marks)
 - c. Show that the spectrum of FM contains infinite number of side bands. (08 Marks)

- 6
 - a. With neat schematic and frequency response, explain the operation of balanced discriminator for demodulation of FM wave. (07 Marks)
 - b. With relevant mathematical analysis, explain reconstruction of message signal form FM wave by PLL. (08 Marks)
 - c. Discuss nonlinear effects in FM systems. (05 Marks)

- 7 a. What are the types of noise, which affect communication system? Explain thermal noise in detail. **(07 Marks)**
- b. An amplifier operating over the frequency range of 450 kHz to 460 kHz is having a input resistance of $75\text{ K}\Omega$. If the temperature is 15°C , find:
- i) The rms noise voltage at the input to the amplifier.
 - ii) The amplifier noise power.
 - iii) Power spectral density. **(06 Marks)**
- c. Discuss the noise factor of amplifiers in cascade and obtain the Friss formula. **(07 Marks)**
- 8 a. Show that the figure of Merit of SSBSC system is unity. **(08 Marks)**
- b. Discuss threshold effect in FM receiving system. **(04 Marks)**
- c. Explain in detail the pre-emphasis and de-emphasis in frequency modulation. **(08 Marks)**

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