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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; June - 2017

Analog Communication

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Calculate the auto correlation function using appropriate equation for $x(t) = A\cos(2\pi f_c t + \theta)$. Assume θ is uniformly distributed over a range of 0 to 2π. 7

b. The random variable '*y*' is the function of another random variable '*x*' such that $y = \cos(x)$ and '*x*' is uniformly distributed in the interval (-π, π) i.e.,

$$f_X(x) = \frac{1}{2\pi}, \quad -\pi < x < \pi$$

$$= 0, \quad \text{otherwise}$$

Find out the mean value of *y*. 5

c. Discuss the properties of Gaussian process. Also define Gaussian process. 8

2 a. Explain the generation of AM wave, using square law Modulator along with neat diagram and necessary equations. 8

b. Describe the demodulation of AM wave using Envelope detector with a neat diagram. 7

c. Determine the Hilbert transform of $\cos(2\pi f_c t)$. 5

UNIT - II

3 a. Explain how two DSBSC modulated waves, can be transmitted through some channel using Quadrature carrier Multiplexing. 7

b. Analyze the demodulation of DSBSC wave using negative feedback system. 8

c. Explain the generation of DSBSC wave using Balanced Modulator. 5

4 a. In a SSB–SC system LSB of message signal is transmitted. The local carrier at the receiver has no frequency error but a phase error of ϕ radian. Discuss the effect of phase error on the demodulated signal. 10

b. With a neat diagram and explanation, derive a time domain expression for an SSB modulated wave. 10

UNIT - III

5 a. Compare the different amplitude modulation techniques. 8

b. Explain the generation of VSB modulated wave. 5

Contd….2

c. Discuss about the High definition TV. 7

6 a. Consider an interval Δt of an FM wave $s(t) = A_c \cos\theta(t)$ such that $\theta(t)$ satisfies the condition, $\theta(t+\Delta t) - \theta(t) = \pi$ Hence show that, if Δt is sufficiently small the instantaneous frequency of the FM wave inside this interval is approximately given by, $f_i(t) \simeq \frac{1}{2\Delta t}$. 5

b. Starting from the time domain expression for single time FM wave, derive an expression for Fourier series representation of the single – tone FM wave S(t) for an arbitrary value of β in terms of Bessel function. 10

c. Define :
i) Frequency derivation ii) Modulation index iii) Phase modulation. 5

UNIT - IV

7 a. Explain the direct method of generating FM wave. 10

b. With a neat-diagram, explain balanced frequency discriminator. 10

8 a. Explain demodulation of an FM wave using phase locked loop using a neat diagram and equations. 10

b. With a neat diagram, explain the basic elements of an FM receiver of the super heterodyne type. 10

UNIT - V

9 a. The available output noise power from an amplifier is 100 nW, the available power gain of the amplifier is 50 dB, and the equivalent noise Band width is 30 MHz. Calculate the noise figure. Assume KT = 4×10^{-21}J. 4

b. Describe the following types of noise :
i) Shot noise ii) Thermal noise iii) White noise. 8

c. Derive the expression for overall equivalent noise temperature T_e for a cascade connection of two port network. 8

10 a. Discuss the effect of noise in DSBSC Receiver. 10

b. Describe the Pre-emphasis and De-emphasis in FM. 10

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