CBCS SCHEME

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17EC44

Fourth Semester B.E. Degree Examination, Jan./Feb. 2023
Principles of Communication Systems

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Illustrate the time domain and frequency domain characteristics of standard Amplitude modulation produced by a single tone. **(08 Marks)**

b. A carried wave 4 sin $(2\pi \times 500 \times 10^3 t)$ volts is amplitude modulated by an audio wave 0.2 sin 3 $[(2\pi \times 500t) + 0.1 \sin 5 (2\pi \times 500t)]$ volts. Determine the upper and lower side band and sketch the complete spectrum of the modulated wave. Estimate the total power in the sideband. **(08 Marks)**

c. Discuss coherent detection of DSBSC modulated waves. **(04 Marks)**

OR

2 a. Discuss the concept of Frequency Translation process with the help of block diagram and spectrum. **(07 Marks)**

b. Explain the system of Quadrature carried multiplexing. **(07 Marks)**

c. Compare the parameters of DSBSC and VSB modulation system. **(06 Marks)**

Module-2

3 a. Explain single tone-frequency modulation. Derive necessary FM equation. **(08 Marks)**

b. Calculate the carrier swing, carrier frequency freq deviation and modulation index for an FM wave, which reaches max freq of 99.047 MHz and minimum frequency of 99.023 MHz. The frequency of modulating signal is 7 kHz. **(08 Marks)**

c. Explain Direct Method of generating FM wave. Draw block diagram of Generating WBFM wave with frequency stabilization. **(04 Marks)**

OR

4 a. Explain FM demodulation using PLL. Develop non-linear model of PLL. **(10 Marks)**

b. Explain with block diagram FM Stereo Multiplexing. **(10 Marks)**

Module-3

5 a. Explain the conditional probability with mathematical expressions. State and prove Baye's rule. **(07 Marks)**

b. Define and write the expressions for mean, correlation and covariance function. **(07 Marks)**

c. Explain the properties of auto correlation function with mathematical expressions. **(06 Marks)**

OR

6 a. Briefly explain the noises such as shot noise, thermal noise and white noise. **(09 Marks)**

b. Derive an expression for noise equivalent Bandwidth, with relevant circuit and equations. **(07 Marks)**

c. Briefly explain the Noise factor and noise figure with equations. **(04 Marks)**

Module-4

7 a. Derive the figure of merit of AM Receivers. **(10 Marks)**

b. Explain about pre – emphasis and de – emphasis in FM system. **(10 Marks)**

OR

8 a. Show that the figure of merit of FM is $\frac{3}{2}\beta^2$. **(14 Marks)**

b. An AM receiver operating with a sinusoidal modulating signal has the following specifications. $M = 0.8$ $\varepsilon[SNR]_0 = 30dB$. What is the corresponding signal to noise ratio. **(06 Marks)**

Module-5

9 a. A continuous time signal X(t) has a bandwidth $F_3 = 10$ kHz and it is sampled at $F_s = 22$ kHz using 8bit/sample. The signal is properly scaled. So that $|X(n)| < 128$ for all n.

(i) Determine your best estimate of the variance of the quantization error σ_e^2.

(ii) We want to increase the sampling rate by 16 times. How many bits per samples you would use in order to maintain the same level of quantization? **(08 Marks)**

b. State and prove sampling theorem. **(08 Marks)**

c. Mention advantages of digital communication. **(04 Marks)**

OR

10 a. Explain TDM with neat block diagram. **(10 Marks)**

b. Find the Nyquist rate and Nyquist interval for:

i) $m_1(t) = \frac{1}{2\pi}\cos(4000\pi t)\cos(1000\pi t)$

ii) $m_2(t) = \frac{\sin 500\pi t}{\pi t}$ **(10 Marks)**

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