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Question Paper Code : 80123

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third/Fourth Semester

Electronics and Communication Engineering

EC 8491 — COMMUNICATION THEORY

(Common to Geoinformatics Engineering/
Computer and Communication Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why DSBFC-AM is bandwidth inefficient when compared with single sideband AM?

2. Mention any four advantages of having RF amplifier in AM receiver.

3. Differentiate narrowband from wideband FM.

4. Define transmission bandwidth.

5. What is the difference between random variable and random process?

6. When a random process is said to be strict sense or strictly stationary?

7. Give the formula for finding the Noise Figure.

8. Define equivalent noise temperature of a system.

9. What do you mean by sampling rate?

10. How the multiplexing of digital signals can be accomplished?

PART B — (5 × 13 = 65 marks)

11. (a) (i) A 10 kW carrier wave is amplitude modulated at 80% depth of modulation by a sinusoidal modulating signal. Calculate the sideband power, total power and the transmission efficiency of the AM wave. (4)

(ii) Explain the working of Super heterodyne receiver with a neat diagram. (9)

Or

(b) Explain in detail the generation and demodulation of DSB-SC with a simple diagram. (13)

12. (a) Explain the characteristics and features of demodulation of FM signal with a neat diagram. (13)

Or

(b) (i) Discuss about the need for frequency translation. (5)

(ii) What does PLL consist of? Draw the diagram and explain. (8)

13. (a) (i) Describe the central limit theorem. (8)

(ii) Assuming X is a Gaussian random variable with $m = 0$ and $\sigma = 1$, find the probability density function of the random variable $Y = aX + b$. (5)

Or

(b) Describe the properties of power spectral density. (13)

14. (a) Explain pre-emphasis and de-emphasis in FM system with a neat diagram. (13)

Or

(b) (i) Discuss about any four properties of in-phase and quadrature components of a narrowband noise. (8)

(ii) Calculate the noise voltage at the input of a television RF amplifier, using a device that has a 200Ω equivalent noise resistance and 300Ω input noise resistance. The bandwidth of the amplifier is 6MHz, and the temperature is 17°C. (5)

15. (a) (i) Explain the working of PWM with a neat sketch. (9)

(ii) Write down the corrective measures to combat the effects of aliasing. (4)

Or

(b) (i) Write the advantages and some of the applications of PCM system. (5)

(ii) Briefly describe the concept of FDM. (8)

PART C — (1 × 15 = 15 marks)

(Application/Design/Analysis/Evaluation/Creativity/Case study questions)

16. (a) (i) A random process $X(t)$ is defined by

$$X(t) = A\cos(2\pi f_c t)$$

where A is a Gaussian-distributed random variable of zero mean and variance σ_A^2. This random process is applied to an ideal integrator, producing the output.

$$Y(t) = \int_0^t X(\tau)\, d\tau$$

(1) Determine the probability density function of the output $Y(t)$ at a particular time t_k.

(2) Determine whether or not $Y(t)$ is stationary.

(3) Determine whether or not $Y(t)$ is ergodic. (12)

(ii) Compare FM and PM system. (3)

Or

(b) (i) A message signal $m(t) = \cos 2000\pi t + 2\cos 4000\pi t$ modulates the carrier $c(t) = 100\cos 2\pi f_c t$ where $f_c = 1MHz$ to produce the DSB signal $m(t)c(t)$. (5 + 5)

(1) Determine the expression for the upper sideband (USB) signal.

(2) Determine and sketch the spectrum of the USB signal.

(ii) Write a brief note on VSB. (5)

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