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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2019

ELECTRONICS AND COMMUNICATION ENGINEERING

Semester IV

EC8401 Communication Theory

(R 2012)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Determine the Fourier transform of the signal $x(t) = 20\cos(2\pi \cdot 10^3 t) * 4\cos(200\pi t)$
2. Determine the transmit power of an AM signal with carrier power of 12watts and 60% modulation index.
3. Write down the relationship between FM and PM.
4. A 1 MHz carrier signal is frequency modulated by a sinusoidal signal of 2kHz. If a frequency deviation of 15 kHz is assumed, determine the practical bandwidth of the modulated signal.
5. State central limit theorem.
6. Differentiate random process from random variable.
7. Compare the Noise performances of AM, DSBSC and SSBSC receivers.
8. State any two properties of Narrowband Noise.
9. Illustrate the need for non uniform quantization.
10. A 4kHz speech signal is sampled at a rate 3 times the Nyquist rate. If the samples are quantized by a 512 level quantizer, determine the number of bits generated in a second.



Part – B (5 x 16 = 80 marks)

11. a) i. A. Let random variables X and Y be defined as $X = A \cos \Theta$ and $Y = B \sin \Theta$, where Θ is a random variable uniformly distributed over $[0, 2\pi]$. Show that X and Y are uncorrelated, but not independent. (6)
ii. Let random processes X(t) and Y(t) be defined as $X(t) = A \cos(\omega t + \Theta)$ and $Y(t) = B \sin(\omega t + \Theta)$, where Θ is a random variable uniformly distributed over $[0, 2\pi]$. Determine Autocorrelation function $R_{XX}(\tau)$ and Cross correlation function $R_{XY}(\tau)$ (6)
iii. Discuss the properties of Gaussian Noise. (4)
12. a) i) Explain the operation of envelope detector. (8)
ii) Describe the method of generating AM signal using switching modulator. (8)

(OR)

- b) i) Explain the operation of super heterodyne receiver with neat block diagram. Draw the time domain signal at the output of each block. (8)
- ii) With neat block diagram explain the demodulation of DSBSC signal (8)
13. a) i) Discuss the FM stereo multiplexing system. (8)
- ii) Explain the generation of FM signal in direct method. (8)

(OR)

- b) Substantiate the operation of balanced slope detector as FM demodulator with necessary equations.
14. a) Obtain the expression for the figure of merit of FM receiver. Comment on the capture effect.

(OR)

- b) i) Derive the expression for the figure of merit of SSBSC receiver. (10)
- ii) An amplifier is defined of three stages with gain 5.5 dB, 23 dB and 15 dB. The noise figures of the stages are 3 dB, 10.3 dB and 12 dB respectively. Determine the overall noise figure and the noise equivalent temperature. Assume the reference temperature as 300k. (6)
15. a) With neat block diagram explain the Delta Modulator. If a single tone sine wave is given as an input to the DM, determine the maximum amplitude of the sine signal so that slope overload noise is not present. Discuss a method to avoid both slope overload and granular noises?

(OR)

- b) i) Briefly explain the Time Division Multiplexing scheme. (4)
- ii) Explain the DPCM scheme with neat block diagram. How is the predictor made adaptive? Discuss the different types of adaptive predictor with their merits and demerits (12)

