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Question Paper Code : 50493

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023

Third/Fourth Semester

Electronics and Communication Engineering

EC 8491 – COMMUNICATION THEORY

(Common to: Computer and Communication Engineering/Geoinformatics Engineering)

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw illustrative spectrums of DSB-SC and AM signals.

2. Write the modulation technique used for analog TV broadcasting system.

3. Compute the bandwidth requirement for a 15 kHz signal frequency modulated with modulation index of 5.

4. Comment on the output of frequency multiplier while FM signal is applied at its input.

5. What is meant by WSS process?

6. Comment on correlation between two random processes if they are independent.

7. If a system has 10 dB noise figure, compute its noise equivalent temperature.

8. What is threshold effect of AM receivers?

9. A signal has 100 Hz and 200 Hz components. If it is sampled at rate equal to 4 times that of Nyquist rate, determine the sampling rate.

10. Write the application on μ-law in communication systems.

PART B — (5 × 13 = 65 marks)

11. (a) Draw the circuit of envelope detector and describe its principle of operation along with different cases of modulation index.

Or

(b) Draw the schematic of SSB modulator and explain the how SSB-LSB and SSB-USB can be generated from its first principle with the help of illustrative spectrums.

12. (a) Differentiate NBFM and WBFM. Also derive the spectrum of WBFM.

Or

(b) Draw the schematic of indirect FM generation and explain its operation with an example.

13. (a) Derive the power spectral density of output signal of a LTI system excited by a WSS process.

Or

(b) Let two random signal $X(t) = A \cos(\omega t + \varphi)$ and $Y(t) = A \sin(\omega t + \varphi)$ where, A and ω are constants and, φ is uniformly distributed random variable in the range $[-\Pi, \Pi]$. Verifty whether they are independent and uncorrelated.

14. (a) Derive figure of merit of AM signal demodulated using envelope detector and compare the same with DSB-SC receiver.

Or

(b) Draw the output noise spectrum of FM receiver and discuss the need of pre-emphasis and de-emphasis with the help of their schematic diagrams.

15. (a) Draw the schematic diagram of pulse code modulator and describe the salient design aspects of sampler, quantizer and multiplexer.

Or

(b) Draw illustrative modulated signals of PAM, PWM and PPM while a sinusoidal signal is modulated and explain how PPM signal is generated using PWM signal using the signals with a schematic diagram.

PART C — (1 × 15 = 15 marks)

16. (a) Consider a message signal $m(t) = 5 \cos(2000\Pi t)$ and carrier signal $c(t) = \cos(2\Pi \, 10^6 t)$. Draw the schematic of modulator, spectrums of input and output signals of the modulator if the modulator is.

(i) amplitude modulator with modulation index of 0.5 (8)

(ii) frequency modulator with modulation index of 0.5 (7)

Or

(b) Consider a message signal $m(t) = 5 \cos(2000\Pi t)$. It is sampled at a rate of 8000 samples/s.

(i) Draw the sampled signal (4)

(ii) Draw the modulated signals for PAM and PWM modulators (6)

(iii) Compute the resolution of encoder and data rate requirement for the system if PCM is used with quantizer 256 (5)

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