

Fifth Semester B.E. Degree Examination, June/July 2013

Analog Communication

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Explain the terms mean, correlation and covariance functions. (09 Marks)
- b. Explain the properties of Gaussian process. (06 Marks)
- c. The PSD of a random process $X(t)$ is shown in Fig.Q1(c).
 - i) Determine and sketch the autocorrelation function $R_X(\tau)$ of $X(t)$.
 - ii) What is the power contained in $X(t)$?
 - iii) What is the ac power contained in $X(t)$?

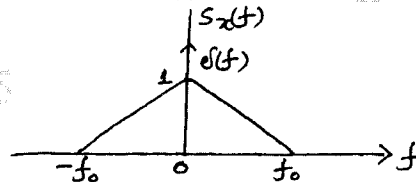


Fig.Q1(c)

(05 Marks)

- 2 a. Explain the operation of the envelope detector with circuit diagram and waveforms. (08 Marks)
- b. What is the significance of double side band suppressed carrier modulation? Explain with time domain description. (04 Marks)
- c. Explain the operation of the Ring modulator circuit which generates the DSBSC waves. (08 Marks)
- 3 a. Explain the operation of quadrature carrier multiplexing scheme with transmitter and receiver diagrams. (08 Marks)
- b. With a block diagram approach, explain the phase discrimination method for generating SSB modulated wave. (08 Marks)
- c. Explain the demodulation of SSB waves with a block diagram and mathematical expressions. (04 Marks)
- 4 a. What is an importance of the vestigial sideband system? Explain the spectrum of VSB modulated wave containing a vestige of the lower sideband with frequency domain description. (06 Marks)
- b. Give comparison of amplitude modulation techniques. (06 Marks)
- c. With a block-diagram approach, explain the operation of the frequency division multiplexing scheme. (08 Marks)

PART – B

- 5 a. What are the advantages of frequency modulation? Give relationship between frequency modulation and phase modulation, with scheme for generating an FM wave by using a phase modulator and also scheme for generating a PM wave by using a frequency modulator. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 5 b. With block diagram approach, explain the generation of wideband FM wave by first generating narrow band FM wave then convert narrow band FM wave into wideband FM wave, using frequency multiplier. (08 Marks)
- c. The equation of an FM wave is given as $S(t) = 10 \sin[5.7 \times 10^8 t + 5 \sin 12 \times 10^3 t]$. Calculate: i) Carrier frequency, ii) Modulating frequency, iii) Modulation index, iv) Frequency deviation, v) Power dissipated in 100Ω load. (05 Marks)
- 6 a. Explain the operation of balanced discriminator with circuit diagram, and characteristics for the demodulation of FM signals. (08 Marks)
- b. With a block diagram approach, explain the operation of FM stereo multiplexing with multiplexer in transmitter of FM stereo and demultiplexer in receiver of FM stereo. (08 Marks)
- c. Briefly explain about the phase-locked loop. (04 Marks)
- 7 a. Explain briefly on the following:
 i) Shot noise
 ii) Thermal noise (05 Marks)
- b. Derive an expression for equivalent noise temperature (T_e) of overall circuit having number of amplifiers connected in cascade connection. (07 Marks)
- c. Three amplifiers have following characteristics:
 Amplifier 1: $F_1 = 8 \text{ dB}$, $G_1 = 42 \text{ dB}$
 Amplifier 2: $F_2 = 9 \text{ dB}$, $G_2 = 38 \text{ dB}$
 Amplifier 3: $F_3 = 5 \text{ dB}$, $G_3 = 22 \text{ dB}$
 The amplifiers are connected in tandem. Determine which combination gives the lowest noise factor referred at input. (08 Marks)
- 8 a. Considering the model of DSBSC receiver using coherent detection, explain the noise in DSBSC receivers. (08 Marks)
- b. An FM receiver receives an FM signal $S(t) = 10 \cos [2\pi \times 10^8 t + 6 \sin (2\pi \times 10^3 t)]$. Calculate the figure of merit of this receiver. (04 Marks)
- c. With circuits and characteristics, explain the importance of pre-emphasis and de-emphasis in FM system. Explain the operation briefly. (08 Marks)

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