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10EC53

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022

Analog Communication

Time: 3 hrs. Max. Marks:100

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

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.

PART – A

1 a. Describe mean, correlation and covariance functions with respect to stationary random process. **(06 Marks)**

b. State and discuss central limit theorem. **(08 Marks)**

c. Let X be a continuous random variable having a uniform probability distribution defined in the range $2 \leq x \leq 4$. Let $y = 3x + 2$. Find the means m_x and m_y. **(06 Marks)**

2 a. Explain the operation of the switching modulator with circuit diagram and relevant waveforms. **(07 Marks)**

b. A broadcast transmitter radiates 20 kilowalts when the modulation percentage is 75. Calculate the carrier power and power of each sidebands. **(04 Marks)**

c. With relevant circuit diagram and waveforms explain the operation of the ring modulator which generates the DSBSC waves. **(09 Marks)**

3 a. Explain the operation of the quadrature – carrier multiplexing system with transmitter scheme and receiver scheme. **(08 Marks)**

b. With relevant diagram explain the operation of the phase discrimination method for generating an SSB modulated wave. **(08 Marks)**

c. What are the advantages and applications of the SSB method? **(04 Marks)**

4 a. What is the significance of the vestigial sideband modulation? Explain the frequency domain description of VSB modulated wave with relevant spectrum. **(06 Marks)**

b. With block diagram approach explain the operation of the frequency division multiplexing system. **(07 Marks)**

c. With neat block diagram, explain the operation of the super-heterodyne receiver. Describe the functions of each and every block. **(07 Marks)**

PART – B

5 a. The equation for an FM wave is $s(t) = 10 \sin[5.7 \times 10^8 t + 5 \sin 12 \times 10^3 t]$. Calculate :

i) Carrier frequency f_c
ii) Modulating signal frequency f_m
iii) Modulation index
iv) Frequency deviation
v) Power dissipated in 100Ω resistor. **(05 Marks)**

b. With circuit diagram and relevant expressions explain the operation of the direct method of generating FM wave. **(07 Marks)**

c. Define frequency modulation. Briefly explain about the basic concepts of angle modulation. Derive an expression for the single tone frequency modulation. **(08 Marks)**

6 a. Explain the operation of the balanced slope detector with circuit diagram and characteristics of it. Mention the advantages and disadvantages of the same. **(07 Marks)**

b. With relevant block – diagram explain the operation of the FM – stereo multiplexing system. And also write the composite frequency spectrum of stereo FM multiplexed modulating signal, including operational SCA. **(07 Marks)**

c. Explain the linear model of the phase – locked loop with relevant diagram. **(06 Marks)**

7 a. Explain the following briefly :

i) Short noise
ii) Thermal noise
iii) White noise. **(06 Marks)**

b. Derive an expression for signal to noise ratio of a Tandem connection and hence to obtain the expression for signal to noise ratio at the end of m links. **(07 Marks)**

c. A turned circuit resonates at 100MHz by a capacitance of 20PF. The Q factor of the circuit is 40. If this circuit is maintained at 17°C with bandwidth 10KHz, calculate the effective noise voltage. **(04 Marks)**

d. An amplifier has a noise figure of 13 dB. Calculate the equivalent amplifier input noise for a bandwidth of 1MHz. **(03 Marks)**

8 a. With relevant diagram and expressions explain the noise in DSB – SC receivers. **(07 Marks)**

b. Briefly explain the noise in FM receivers with relevant expressions. **(06 Marks)**

c. What is an importance of pre-emphasis and De-emphasis in FM system? Explain the operations of pre-emphasis and De-emphasis with relevant circuits. **(07 Marks)**

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