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10EC53

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Analog Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define Gaussian process and explain central Limit Theorem. **(06 Marks)**

b. State and explain three properties of auto correlation function. **(09 Marks)**

c. The random variable Y is the function of another random variable X in such way that Z = Cos (x) and X is uniformly distributed in the interval $(-\pi, \pi)$ ie.

$$f_x(x) = \frac{1}{2\pi} \text{ for } -\pi < x < \pi$$
$$= 0 \quad \text{otherwise}$$

Determine the expected value of z **(05 Marks)**

2 a. Represent an AM signal both in Time Domain and Frequency Domain giving their derivation and spectrums. **(08 Marks)**

b. Explain the AM Generation using switching modulator and give the spectrum representation of same. **(07 Marks)**

c. The Antenna current of an AM Transmitter is 6Amps when only carrier is sent but increased to 7Amps when the carrier is modulated by a single tone sinusoid. Find the percentage modulation. **(05 Marks)**

3 a. Explain coherent detection of a DSBSC wave with a Block Diagram. Also explain Quadrature null effect. **(07 Marks)**

b. Explain Quadrature carrier multiplexing with Block Diagram and Spectrums. **(07 Marks)**

c. Given $x(t) = \text{Cos}(2\pi f_c t)$ and $x(t) = \text{Sin } f_c(t)$. Find the Hilbert Transform $\hat{x}(t)$ in both the cases. **(06 Marks)**

4 a. Represent SSB both in Time Domain and Frequency Domain giving its spectrums. Also Give some advantages and disadvantages of SSB. **(08 Marks)**

b. Explain how to generate a VSB signal and give its frequency spectrum. **(05 Marks)**

c. Explain the process Frequency Translation in communication with a Block diagram. **(07 Marks)**

PART – B

5 a. Obtain the expression for single Tone sinusoidal FM wave and prove that FM has infinite number of side bands. **(09 Marks)**

b. Explain the Demodulation of FM wave by using Balanced frequency discriminator circuit and its frequency response. **(07 Marks)**

c. Calculate the maximum bandwidth requirements for FM broadcasting. Given maximum deviation allowed is 75KHz and maximum modulation frequency allowed is 10KHz. **(04 Marks)**

6 a. Explain PLL with a neat block diagram and derive the expression for the output. **(08 Marks)**

b. Explain a Linearised model of a PLL and obtain the expression for the output voltage. **(06 Marks)**

c. The equation for an FM wave is given by $s(t) = 10\text{Sin}\,[5.7 \times 10^8 t + 5\ \text{Sin}\ 12 \times 10^{13} t]$. calculate :
(i) Carrier frequency (ii) Modulating frequency (iii) Modulation index
(iv) Frequency deviation (v) Power dissipated in 100Ω **(06 Marks)**

7 a. Explain the following :
(i) Thermal Noise (ii) Noise equivalent Band width (iii) Equivalent noise temperature. **(09 Marks)**

b. Obtain equivalent noise temperature of two networks in cascade as shown below :

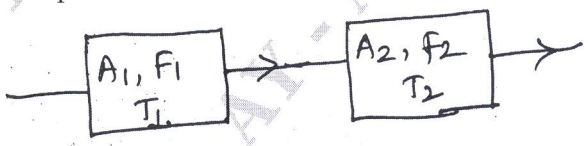

Fig Q7(b)

Where A_1, A_2 – are Gains ; F_1F_2 – Noise Figures. T_1 T_2 – Temperature of two networks. **(06 Marks)**

c. A mixer of microwave receiver has noise Figure of 11 dB is preceded by a low noise amplifier having a power gain equal to 20dB and $T_1 = 33°K$. Calculate effective noise equivalent temperature of the combination. **(05 Marks)**

8 a. Calculate the figure of merit in the case of a SSB wave. **(07 Marks)**

b. Explain pre-emphasis and De-emphasis in FM. **(07 Marks)**

c. The average noise power per unit band width measured at the front end of AM receiver is |mw|Hz. The modulating wave is sinusoidal with a carrier power of 80k watts and side band power of 10k watts/side band. The message band width is 4KHz. Assuming the envelope detector in the receiver determine the output signal to noise ratio of the system. **(06 Marks)**

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