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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  $Z = \text{Cos}(x)$  and X is uniformly distributed in the interval  $(-\pi, \pi)$  ie.

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

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)

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.



- 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  $s(t) = 10\sin [5.7 \times 10^8 t + 5 \sin 12 \times 10^{13} t]$ . calculate :
  - (i) Carrier frequency      (ii) Modulating frequency      (iii) Modulation index
  - (iv) Frequency deviation      (v) Power dissipated in  $100\Omega$  (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 :

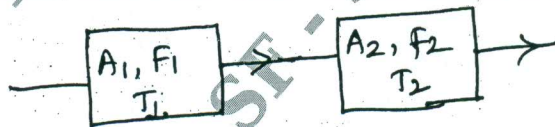


Fig Q7(b)

Where  $A_1, A_2$  – are Gains ;  $F_1 F_2$  – Noise Figures.  $T_1 T_2$  – Temperature of two networks.

- 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  $T_1 = 33^\circ K$ . 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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