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10EC53

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Analog Communication

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Standard notations are used.
3. Draw neat diagram, wherever necessary.
4. Missing data be suitably assumed.

PART – A

1 a. Define Random variables and differentiate between discrete and continuous random variables. List the properties of PDF. **(07 Marks)**

b. Discuss the properties of Gaussian process. **(07 Marks)**

c. State and prove Central Limit theorem. **(06 Marks)**

2 a. Describe the generation of AM wave using square law modulator with mathematical analysis. **(08 Marks)**

b. An AM wave has the form :
$S(t) = 20[1 + 1.5 \cos 2000 \pi t + 1.5 \cos 4000 \pi t] \times \cos 40000 \pi t$.
i) Find the carrier power and side band power ii) Find the S(f) and sketch its spectrum
iii) Find the modulation index. **(07 Marks)**

c. Explain the single tone modulation of DSBSC wave with frequency spectrum. **(05 Marks)**

3 a. Explain the operation of quadrature carrier multiplexing scheme with transmitter and receiver diagrams. **(07 Marks)**

b. Define Hilbert transform. Explain the properties of Hilbert transform. **(07 Marks)**

c. Consider the message signal m(t) containing the frequency components 100Hz, 200Hz and 400Hz. This message signal is applied to a SSB modulator together with a carrier at 100KHz with only USB retained. The coherent detector employed at the receiver uses a local oscillator that gives a sine wave of frequency 100.02KHz. Determine the frequency components of the detector O/P. **(06 Marks)**

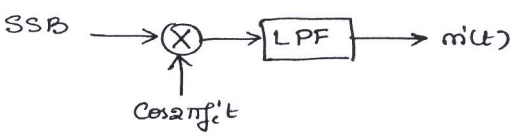

Fig.Q3(c)

4 a. Show that a VSB modulated S(t) containing a vestige of the lower side band is defined by $S(t) = \frac{Ac}{2} m(t) \cos 2\pi fct - \frac{Ac}{2} M_Q(t) \sin 2\pi fct$ with relevant spectrum. **(08 Marks)**

b. Explain how downward frequency translation is achieved with the help of a block diagram and waveforms. **(08 Marks)**

c. Compare amplitude modulation techniques. **(04 Marks)**

PART – B

5 a. Show that the spectrum of FM contains infinite number of sidebands. **(08 Marks)**

b. A 93.2MHz carrier is frequency modulated by a 5KHz sine wave. The resultant FM signal has a frequency deviation of 40 KHz.

i) Find the carrier swing of the FM signal.

ii) What are the highest and lowest frequencies attained by the frequency modulated signal?

iii) Calculate the modulation index for the wave. **(07 Marks)**

c. Give the relationship between frequency modulation and phase modulation, with scheme for generating an FM wave by using a phase modulator. **(05 Marks)**

6 a. Explain FM detection using PLL. **(07 Marks)**

b. Draw the block diagram of balance frequency discriminator and explain it for demodulation of FM signal. **(08 Marks)**

c. Explain non – linearity and its effect in FM system. **(05 Marks)**

7 a. Explain the following :

i) Thermal Noise ii) Shot Noise

iii) Noise figure iv) Equivalent Noise temperature. **(12 Marks)**

b. In a TV receiver a long lossy cable is used to connect the antenna to the receiver. To overcome the effect of lossy cable, a pre – amplifier is mounted on the antenna as shown as fig. Q7(b). Find the overall noise figure with and without pre amplifier. **(08 Marks)**

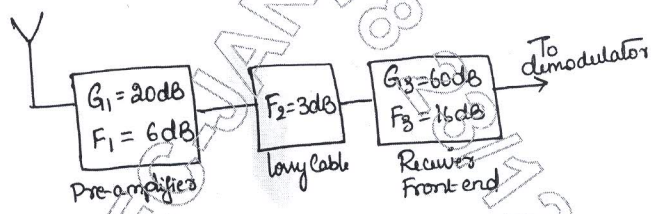

Fig.Q7(b)

8 a. Write short notes on :

i) Pre - emphasis and de-emphasis in FM ii) FM Stereo Multiplexing. **(10 Marks)**

b. Considering the model of DSBSC receiver using Coherent detection, explain the noise in DSBSC receiver and derive the Expression for figure of Merit. **(10 Marks)**

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