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06EC53

Fifth Semester B.E. Degree Examination, May/June 2010
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 with relevant equations mean, autocorrelation and auto covariance of a random process X (t). **(06 Marks)**

b. The probability density function (PDF) of a random variable is given as

$f_X(u) = K$ for u between 2 and 4

$= 0$ otherwise; K is a constant

Sketch : i) PDF ; ii) Determine the value of K ; iii) Find P ($x \leq 3.5$). **(06 Marks)**

c. Define the power spectral density and explain its properties. **(08 Marks)**

2 a. Show that a square law can be used for the detection of an A.M. wave. **(06 Marks)**

b. Consider a message signal $m(t) = 20 \cos (2 \pi t)$ volts ;
and a carrier signal $c(t) = 50 \cos (100 \pi t)$ volts.
i) Sketch to scale resulting AM wave for 75% modulation.
ii) Find the power developed across a load of 100 Ω due to this AM wave. **(06 Marks)**

c. Explain the method of obtaining a practical synchronous receiving system with BSBSC modulated waves using costas loop. **(08 Marks)**

3 a. With a neat block diagram, explain how SSB wave is generated using phase shift method. **(08 Marks)**

b. For the rectangular pulse shown in Fig.3(b), evaluate its Hilbert transform. **(04 Marks)**

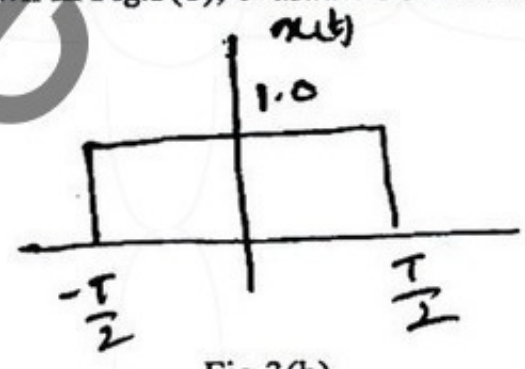

Fig.3(b)

c. Consider a 2-stage SSB modulator as shown in Fig.3(C). The i/p signal consists of voice signal in a frequency range of 0.3 to 3.4 kHz. The two oscillator frequencies have values $f_1 = 100$ kHz and $f_2 = 10$ MHz. Specify the following:

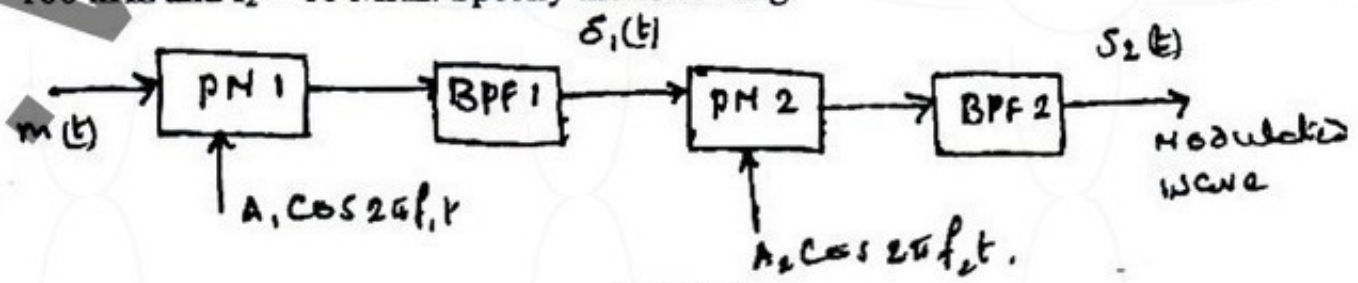

Fig.3(c)

i) Sidebands of DSBSCmodulated waves appearing at the outputs of the product modulation (PM).
ii) Side bands of SSB modulated waves appearing at two BPF outputs.
iii) The pass bands and guard bands of the two BPFs. **(08 Marks)**

4 a. Explain the scheme for generation and demodulation of VSB waves with relevant block diagrams and mathematical expression. **(08 Marks)**
b. With a neat block diagram, explain the operation of FDM technique. **(06 Marks)**
c. With a neat block diagram, explain the operation of AM super heterodyne receiver. **(06 Marks)**

PART – B

5 a. Derive an expression for single tone sinusoidal FM wave; find its spectrum. **(10 Marks)**
b. A sinusoidal modulating voltage of amplitude 5V and frequency 1 kHz is applied to frequency modulator. The frequency sensitivity of modulator is 40 Hz/V. The carrier frequency is 100 kHz. Calculate: i) Frequency deviator ; ii) Modulation index. **(05 Marks)**
c. Explain the methods of FM generation. **(05 Marks)**

6 a. Starting from block diagram of PLL obtain its non linear and linear model. Show that output of PLL is scaled version modulating signal. **(12 Marks)**
b. Explain with relevant block diagram FM stereo multiplexing. **(08 Marks)**

7 a. Define noise figure and explain its significance. **(06 Marks)**
b. Define noise equivalent band width. Derive the expression for the same. **(08 Marks)**
c. Two 2-port devices are connected in cascade. For the first stage, noise figure and available power gain are 5 db and 12 db respectively. For the second stage the corresponding values are 15 db and 10 db. Determine the over all noise figures in db. **(06 Marks)**

8 a. Derive the expression for the output SNR of an AM receiver using envelope detector. **(08 Marks)**
b. Explain threshold effect in FM. Also explain how it is minimized. **(06 Marks)**
c. A DSBSC signal is transmitted over a noisy channel with PSD of noise as shown in Fig.8(c). The message bandwidth is 4 kHz and carrier frequency is 200 kHz. Assume average power of the modulated wave 10 watts. Determine the output SNR of the receiver. **(06 Marks)**

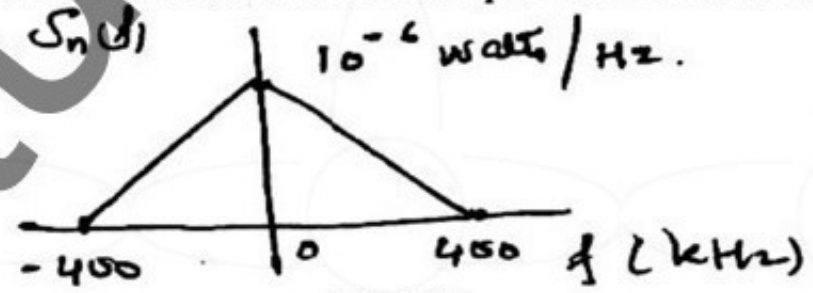

Fig.8(c).

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