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10EC53

Fifth Semester B.E. Degree Examination, June/July 2016 **Analog Communication**

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART - A

- Explain mean, correlation and covariance functions of a random process x(t). 1 (08 Marks) (12 Marks)
 - Explain the properties of auto correlation function and power spectral density.
- Define demodulation and show that a square law device can be used to detect AM waves. 2
 - (07 Marks) Explain the generation of DSB -SC wave using ring modulator.
 - (08 Marks) A 250 W carrier of 1000 KHz is simultaneously modulated by sinusoidal signals of 2 KHz, 6 KHz and 8 KHz with modulation indices of 35%, 55% and 75% respectively. What are the frequencies present in the modulated wave and what is the radiated power? (05 Marks)
- With the neat diagram, explain the operation of quadrature carrier multiplexing. 3 (06 Marks)
 - b. Describe phase discrimination method of generating SSB waves. (06 Marks)
 - Consider a message signal m(t) containing the frequency complents 100, 200 and 400 Hz. This message signal is applied to an SSB modulator together with a carrier at 100 KHz with only USB retained. The coherent detector employed at the receiver uses a local oscillator that gives a sine wave of frequency 100.02 KHz.
 - i) Determine the frequency component of the detector output
 - ii) Repeat your analysis assuming only LSB is transmitted. (08 Marks)
- Derive the time domain expression of VSB modulated wave s(t) containing a vestige of upper side band. (07 Marks)
 - b. Explain the scheme for generation and demodulation of VSB waves with relevant block diagrams, and mathematical expressions. (07 Marks)
 - With a neat block diagram, explain the operation of AM super heterodyne receiver.

(06 Marks)

(08 Marks)

PART - B

- Define the terms: i) modulation index ii) band width iii) frequency deviation in the case of 5 frequency modulation. (06 Marks)
 - b. Explain the direct method of generating FM waves.

An angle modulated signal is defined by $s(t) = 10 \cos [2\pi \times 10^6 t + 0.2 \sin 2000 \pi t]$ volts find the following:

- i) The power in modulated signal
- The frequency deviation Δf ii)
- iii) Phase deviation Δθ
- The approximate transmission bandwidth.

(06 Marks)

- a. With the help of circuit diagram, explain demodulation of FM wave using balanced 6 frequency discriminator. (08 Marks)
 - With relevant block diagram, explain FM stereo multiplexing.

(06 Marks)



7 a. Define: shot noise, thermal noise, white noise.

(06 Marks)

b. Define noise equivalent band width and derive the expression for the same.

(08 Marks)

- c. Two 2-port devices are connected in cascade. For the first stage, the noise figure and available power gain are 5 dB and 12 dB respectively. For the second stage, the noise figure and available power gain are 15 dB and 10 dB respectively. Determine the overall noise figure in dB.

 (06 Marks)
- 8 a. Derive the expression for the figure of merit of DSB SC receiver.

(10 Marks)

b. Describe the pre – emphasis and de -emphasis in FM.

(06 Marks)

An FM signal with a deviation of 75 KHz is applied to an FM demodulator. When the input SNR is 15 dB, the modulating frequency is 10 KHz, estimate the SNR at the demodulator (04 Marks)