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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Fourth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; June - 2016

Analog Communication Theory

Time: 3 hrs

Max. Marks: 100

Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.
ii) Assume suitable missing data if any.

UNIT - I

1. a. Illustrate the time and frequency domain character of standard amplitude modulation produced by a single tone frequency component, also obtain the equation for carrier power, upper side frequency power, lower side frequency power, if average power delivered to 1 Ω resistor. 6
- b. Explain with the help of a neat sketch, how square law modulator is used to generate AM. 6
- c. An audio frequency signal $5\sin 2\pi(1000)t$, used to amplitude modulate a carrier of $100\sin 2\pi(10^6)t$. Assume modulation index as 0.4. Find;
 - i) Side band frequencies 8
 - ii) Amplitude of each sideband
 - iii) Bandwidth required
 - iv) Total power delivered to a load of 100 Ω .
2. a. Consider a message signal $m(t) = 20\cos(2\pi)t$ V and the carrier wave $C(t) = 50\cos(100\pi)t$ V,
 - i) Write an expression for the resulting AM wave for 75% modulation in time domain. 10
 - ii) Draw the spectrum of AM wave.
 - iii) Sketch the resulting wave for 75% modulation.
- b. Define Hilbert transform and explain the properties of Hilbert transform. 6
- c. A standard AM transmission, sinusoidally modulated to depth of 40%, produces sideband frequencies of 6.824 and 6.854 MHz. The amplitude of each side band frequency is 50 V determine the amplitude and frequency of the carrier. 4

UNIT - II

3. a. Explain the generation of DSBSC waves using ring modulator with necessary mathematical equations. 10
- b. Explain the operation of coherent detection of DSBSC modulating wave along with the costax loop of obtaining synchronous receiving system. 10

- 4. a. Compare the various parameters of SSB-SC wave with DSB-SC wave. 4
- b. Explain the generation of an SSB wave using filtering method. 10
- c. Write short note on QAM system. 6

UNIT - III

- 5. a. What is meant by VSB? Explain the scheme for generation and demodulation of VSB modulated wave. 10
- b. With a neat block diagram explain the operation of FDM techniques, with example. 10
- 6. a. Obtain the expression for an FM and PM wave. Also write the waveforms. 10
- b. A 93.2 MHz carries is frequency modulated by a 5 kHz sine wave, the resultant FM signal has a frequency deviation of 40 kHz,
 - i) Find the carrier swing of the FM signal. 10
 - ii) What are the highest and lowest frequencies attained by the frequency modulated signal?
 - iii) Calculate the modulation index for the wave.

UNIT - IV

- 7. a. Show that NBFM wave have infinite BW. 10
- b. Explain with block diagram the generation of narrow band FM using DSB-SC modulation. 10
- 8. a. The equation for an FM wave is,

$$S(t) = 10\sin [5.7 \times 10^8 t + 5\sin 12 \times 10^3 t]$$
 Calculate : 10
 - i) Carrier frequency ii) Modulating frequency iii) Modulation index
 - iv) Frequency deviation v) Power dissipated in 100 Ω
- b. Explain the detection process of FM signals using balanced slope detector circuit with relevant diagrams. 10

UNIT - V

- 9. a. Derive the equation for Noise factor for cascade connection of two port networks. 10
- b. Explain different types of noise which effect the communication system. 10
- 10 a. The available o/p noise power from an amplifier is 100 nW the available power gain of the amplifier is 50 dB and the equivalent noise bandwidth is 30 MHz. Calculate the noise figure. 5
Assume $K_T = 4 \times 10^{-21} \text{J}$.
- b. What do you mean by equivalent noise temperature? 5
Also derive the equation for equivalent noise temperature when amplifiers are connected in cascade. 10

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