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Question Paper Code : 33381

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fifth Semester

Electronics and Communication Engineering

EC 1301 — COMMUNICATION THEORY

(Common to EC 1302 A — Communication Systems)

(Regulation 2004/2007)

(Common to B.E. (Part-Time) Fourth Semester, Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by frequency translation?

2. Compare the performances of AM, DSBSC and SSB.

3. A frequency modulated wave with a carrier frequency of 200 MHz is modulated using a sinusoidal of frequency 15 KHz. The modulation index is 2.0. Obtain the transmission bandwidth.

4. Mention the non-linear effects in FM Systems.

5. Assume that a zero mean AWGN of power spectral density No./2 is passed through an ideal band pass filter of centre frequency f_C and bandwidth 2B. Obtain the expression for the autocorrelation function of the filtered noise.

6. Define the term noise equivalent bandwidth.

7. Mention the purpose of pre-emphasis and de-emphasis in FM.

8. What is meant by FM threshold reduction?

9. State Source coding theorem.

10. State Channel coding theorem.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What do you understand by carrier synchronization? (3)

(ii) Discuss the method of demodulation of DSBSC signal using Costas loop. (8)

(iii) An SSB signal is generated by modulating an 800 KHz carrier by the signal $m(t) = \cos 2000\pi t + 2\sin 1200\pi t$. The amplitude of the carrier is Ac = 10. Obtain the magnitude spectrum of the lower sideband SSB signal. (5)

Or

(b) (i) Draw the block diagram of a superheterodyne receiver and explain the function in detail. (10)

(ii) With neat sketch explain the Frequency Division Multiplexing. (6)

12. (a) Describe FM demodulation using frequency discriminator in detail. (16)

Or

(b) (i) Compare the performance of linear model of PLL and non-linear model of PLL. (8)

(ii) Derive an expression for the spectrum of FM signal assuming single tone modulation. (8)

13. (a) (i) Discuss the properties of Narrowband noise. (10)

(ii) How could you represent the Narrowband noise in terms of envelope and phase components? (6)

Or

(b) (i) Show that the performance of an SSB system using synchronous detection is equivalent to the performance of both DSB and baseband systems. (10)

(ii) Discuss the properties of shot noise, thermal noise, white noise. (6)

14. (a) Consider an AM system with additive thermal noise having a power spectral density $\eta/2 = 10^{-12}$ W/Hz. Assume that the baseband message signal $x(t)$ has a bandwidth of 4 KHz and the amplitude distribution

shown by Fig. The signal is demodulated by envelope detection and appropriate post detection filtering. Assume $\mu = 1$.

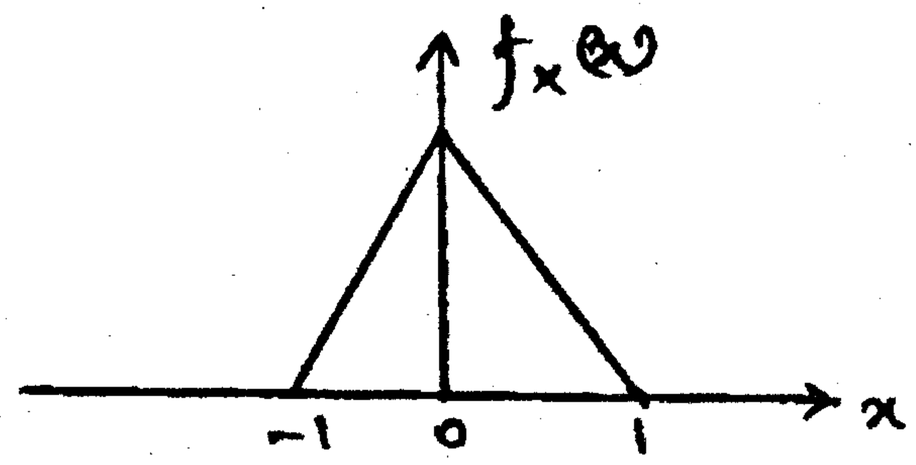

Fig.

(i) Find the minimum value of the carrier amplitude Ac that will yield $(S/N)_0 \geq 40$ dB. (8)

(ii) Find the threshold value of Ac. (8)

Or

(b) (i) Write notes on threshold effect in FM. (6)

(ii) Explain the effect of noise in detail and compare the performance of AM and FM in the presence of noise. (10)

15. (a) (i) Define Mutual information. Find the relation between the mutual information and the joint entropy of the channel input and channel output. (12)

(ii) What are the implications of information capacity theorem? (4)

Or

(b) (i) Discuss the properties of Discrete memoryless channel. (10)

(ii) What is entropy? Explain the important properties of entropy. (6)
