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Question Paper Code : 91401

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fourth Semester

Electronics and Communication Engineering

EC 2252/EC 42/EC 1252/080290020 — COMMUNICATION THEORY

(Regulation 2008)

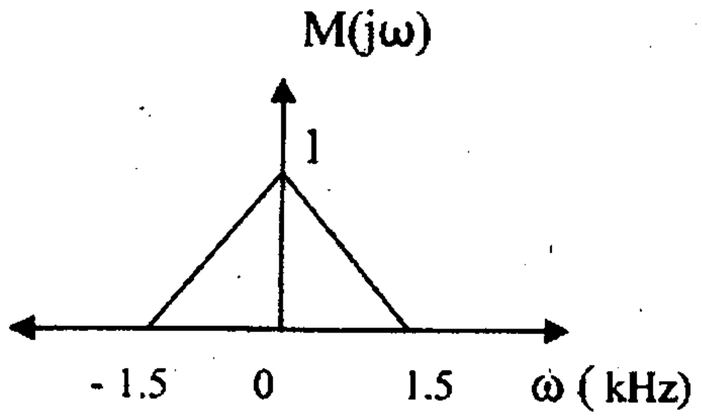
(Common to PTEC 2252 Communication Theory for B.E. (Part-Time) Third Semester ECE – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Consider the signal whose spectrum is as shown in Figure 1 modulates the sinusoidal carrier signal of 1 MHz. Draw the spectrum of AM signal and SSB-SC (upper sideband) signal.



2. Suggest a modulation scheme for the broad cast video transmission and justify.

3. List the advantages of FM over AM.

4. A carrier signal is frequency modulated by a sinusoidal signal of 5 Vpp and 10 kHz. If the frequency deviation constant is 1 kHz/V, determine the maximum frequency deviation and state whether the scheme is narrowband FM or wideband FM.

5. DC current of 2 mA flows through the semiconductor junction. Consider the effective noise bandwidth of 1 kHz and calculate the shot noise component.

6. Define the term noise equivalent temperature.

7. What is meant by image frequency in super heterodyne receiver?

8. Compare the noise performance of DSBSC and FM receivers.

9. A source emits one of the four symbols A, B, C and D with probabilities 1/3, 1/6, 1/4 and 1/4 respectively. The emissions of symbols by the source are statistically independent. Calculate the entropy of the system.

10. Write the Shannon's theorem for channel capacity.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the generation of SSB SC signal using phase shift method. (8)

(ii) Suggest a scheme for recovering the message signal from the signal $s(t) = 2m(t)\cos 2\pi f_c t$. Explain the same. (8)

Or

(b) (i) An AM signal is generated by modulating the carrier $f_c = 800$ MHz by the signal $m(t) = \sin 3000\pi t + 0.5\cos 5000\pi t$. The AM signal $s(t) = 100[1 + m(t)]\cos 2\pi f_c t$ is fed to a 50 Ω load.

(1) Determine the average power in the carrier and in the sidebands.

(2) Find the modulation index and peak power delivered to the load. (6)

(ii) Explain the function of switching modulator in the generation of AM signal. (10)

12. (a) (i) Derive the expression for the single tone frequency modulated signal and hence prove that is the constant envelope modulation requiring infinite bandwidth. (12)

(ii) Draw the typical spectrum of the FM. (4)

Or

(b) (i) Explain the indirect method of generating FM signal. (8)

(ii) Explain the operation of PLL as FM demodulator. (8)

13. (a) (i) Three amplifiers 1,2, and 3 have the following characteristics :

$F_1 = 9$ dB , $G_1 = 50$ dB ; $F_2 = 6$ dB , $G_2 = 30$ dB ; $F_3 = 4$ dB , $G_3 = 20$ dB

The amplifiers are connected in tandem. Determine which combination gives the lowest noise figure. (10)

(ii) Discuss on Thermal noise. (6)

Or

(b) (i) What is meant by narrow band noise? Explain the characteristics of narrow band noise. (12)

(ii) An AWGN of power spectral density 1 μW is fed through a filter with frequency response $H(f) = 1/2$; $|f| < 40\ kHz$
$= 0$; Elsewhere.

Calculate the noise power at the output of the filter. (4)

14. (a) (i) With neat block diagram explain the function of superheterodyne receiver in detail. (12)

(ii) Illustrate the superiority of superheterodyne receiver over single tuned receivers. (4)

Or

(b) Derive the expression for the SNR at the output of the FM receiver. Assume that the input is corrupted by AWGN noise. Discuss the performance of the receiver based on the derived expression. (16)

15. (a) (i) Explain the Huffman source coding algorithm. (6)

(ii) Design a Huffman code for the source given in Q. 9. Determine the average code length and coding efficiency. (10)

Or

(b) (i) Briefly discuss about the lossy source coding schemes. (6)

(ii) Design a Shannon Fano code for the source given in Q. 9. Determine the average code length and coding efficiency. (10)