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Question Paper Code : 42445

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Fourth Semester
Electronics and Communication Engineering
EC 2252 – COMMUNICATION THEORY
(Regulations 2008)
(Common to PTEC 2252 Communication Theory for B.E. (Part-Time) Third Semester – ECE – Regulations 2009)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Draw the spectrum of signal $s(t) = m(t)\cos 2\pi 10^6 t$, where m(t) is unit amplitude 1 kHz sinusoidal signal.
2. What are the modulation schemes used for commercial TV broadcast ?
3. Give basic concept involved in the demodulation FM signal using PLL.
4. How is FM signal generated using phase modulator ?
5. DC current of 3 mA flows through the semiconductor junction. Consider the effective noise bandwidth of 1.2 kHz and calculate the shot noise component.
6. What is meant by thermal noise ?
7. Determine the image frequency in super heterodyne AM receiver tuned to receive signal at 950 kHz.
8. Compare the noise performance of SSBSC and AM receivers.
9. A source emits one of the four symbols A, B, C and D with probabilities 1/2, 1/4, 1/8 and 1/8 respectively. The emissions of symbols by the source are statistically independent. Calculate the entropy of the system.
10. What is meant by lossy and lossless coding techniques ?

PART – B (5×16=80 Marks)

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

ii) Explain the working concept of envelope detector in detail. **(8)**

(OR)

b) i) The output signal from an AM modulator is $u(t) = 5\cos(1800\pi t) + 20\cos(2000\pi t) + 5\cos(2200\pi t)$.

A) Determine the modulating signal m(t) and the carrier c(t).

B) Determine the modulation index.

C) Determine the ratio of the power in the sidebands to the power in the carrier. **(8)**

ii) Discuss the basic concept of frequency division multiplexing with neat block diagram. **(8)**

12. a) Prove that frequency modulation with arbitrary modulation index requires infinite bandwidth while transmit power is constant. **(16)**

(OR)

b) Explain the demodulation of FM signal using balanced frequency discriminator. **(16)**

13. a) i) Discuss the parameter noise figure. **(4)**

ii) Three amplifiers 1, 2 and 3 have the following characteristics.

$F_1 = 2dB$, $G_1 = 50$ dB : $F_2 = 6$ dB, $G_2 = 30$ dB : $F_3 = 4.5$ dB, $G_3 = 22$ dB.

The amplifiers are connected in tandem. Determine which combination gives the lowest noise figure. **(6)**

iii) List the properties of Narrow band noise. **(6)**

(OR)

b) i) Let X and Y be defined as $X = A\cos\Theta$ and $Y = A\sin\Theta$, where Θ, is a random variable uniformly distributed over $[-\pi, \pi]$ and A is a constant. **(8)**

a) Show that X and Y are uncorrelated.

b) Show that X and Y are not independent.

ii) What is meant by a random process ? Discuss the classification of random processes. **(8)**

14. a) i) With neat block diagram explain the function of each block of super heterodyne receiver in detail. **(10)**

ii) Explain the need of pre emphasis and de emphasis in communication systems. **(6)**

(OR)

b) Derive the expression for the figure of merit 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 rate distortion. **(6)**

ii) A discrete memoryless source emits one of the symbols A, B, C, D and E with probabilities 1/3, 1/6, 1/8, 1/8 and 1/4 respectively. Design a Huffman code for the given source. Determine the average code length and coding efficiency. **(10)**

(OR)

b) i) List the properties of entropy. **(6)**

ii) A discrete memoryless source emits one of the symbols A, B, C, D and E with probabilities 1/3, 1/6, 1/8, 1/8 and 1/4 respectively. Design a Shannon Fano code for the given source. Determine the average code length and coding efficiency. **(10)**