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Question Paper Code : 27193

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fourth Semester

Electronics and Communication Engineering

EC 6402 — COMMUNICATION THEORY

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the advantage of conventional DSB-AM over DSB-SC and SSB-SC AM?

2. Draw the block diagram of SSB-AM generator.

3. Compare amplitude and angle modulation schemes.

4. Write the Carson's rule.

5. Define random variable.

6. State Baye's rule.

7. Define noise figure.

8. What is threshold effect?

9. State source coding theorem.

10. State Shanon law.

PART B — (5 × 16 = 80 marks)

11. (a) With relevant diagrams, describe the process of demodulation of DSB-SC AM signal.

Or

(b) With a neat block diagram, explain the function of superheterodyne receiver.

12. (a) Derive the expression for frequency spectrum of FM modulated signal and comment on the transmission bandwidth.

Or

(b) With relevant diagrams, explain how the frequency discriminator and PLL are used as frequency demodulators?

13. (a) In a binary communication system, let the probability of sending a 0 and 1 be 0.3 and 0.7 respectively. Let us assume that a 0 being transmitted, the probability of it being received as 1 is 0.01 and the probability of error for a transmission of 1 is 0.1.

(i) What is the probability that the output of this channel is 1?

(ii) If a 1 is received, then what is the probability that the input to the channel was 1?

Or

(b) What is CDF and PDF? State their properties. Also discuss them in detail by giving examples of CDF and PDF for different types of random variables.

14. (a) Consider a message which is a wide-sense stationary random process with the autocorrelation function $R_M(\tau) = 16\sin c^2(10000\tau)$. All the realizations of the message process satisfy the condition $\max|m(t)| = 6$. This message needs to be transmitted via a channel with a 50 dB attenuation and additive white noise with the power spectrum density $S_n(f) = N_0/2 = 10^{-12}$ W/Hz. The SNR at the modulator output should be at least 50 dB. What is the transmitter power and channel bandwidth if the following modulation schemes are employed?

(i) DSB – SC AM

(ii) SSB – SC AM

(iii) Conventional AM with a modulation index of 0.8.

Or

(b) Give a detailed account on impact of noise on angle modulation schemes. What is the required received power in an FM system with modulation index, β = 5 if W = 15 kHz and $N_0 = 10^{-14}$ W/Hz? The power of the normalized message signal is assumed to be 0.1 Watt and the required SNR after demodulation is 60 dB.

15. (a) (i) The two binary random variables X and Y are distributed according to the joint PMF given by $P(X=0,Y=1)=1/4$; $P(X=1,Y=1)=1/2$; $P(X=1,Y=1)=1/4$; Determine $H(X,Y)$, $H(X)$, $H(Y)$, $H(X/Y)$ and $H(Y/X)$.

(ii) Define entropy and plot the entropy of a binary source.

Or

(b) Explain the Huffman coding algorithm with a flow chart and illustrate it using an example.
