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Question Paper Code : 80118

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third/Fourth Semester

Electronics and Instrumentation Engineering

EC 8395 — COMMUNICATION ENGINEERING

(Common to Computer Science and Engineering/Instrumentation and Control Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What will be the power in each sideband in amplitude modulated signal if power of carrier wave is 176 W and there is 60% modulation.
2. What is Pre-emphasis and De-emphasis circuit? Where these circuits are used?
3. What is bit depth in PCM?
4. What is Companding?
5. What is Duobinary encoding? Why precoding is used.
6. Draw the constellation diagram of QPSK.
7. What is the need of channel coding?
8. List the properties of cyclic codes.
9. What are the benefits of multiple access techniques in the communication system?
10. Define near-far problem in CDMA.

PART B — (5 × 13 = 65 marks)

11. (a) (i) The efficiency η of ordinary AM is defined as the percentage of the total power carried by the side bands, that is,

$$\eta = \frac{P_s}{P_t} \times 100\%$$

Where P_s is the power carried by the sidebands and p_t is the total power of the AM signal.

(1) Find η for $\mu = 0.5$.

(2) Show that for a single tone AM, η_{max} is 33.3 percent at $\mu = 1$. (6)

(ii) Explain the working of FM super heterodyne receiver with neat block diagram. (7)

Or

(b) (i) Discuss the method for the generation of FM using direct method. (6)

(ii) Explain the detection of FM using PLL detector. (7)

12. (a) Describe delta modulation in detail with neat block diagram. Also describe the quantization error in delta modulation.

Or

(b) Draw and explain the TDM with its applications.

13. (a) (i) Derive the expression of probability of error in BPSK. (8)

(ii) Explain QAM modulation system with its constellation and schematic diagrams. (5)

Or

(b) Explain coherent detection of BFSK signal and derive the expression for Probability of error.

14. (a) (i) Consider a binary memoryless source X with two symbols x_1 and x_2. Show that $H(X)$ is maximum when both x_1 and x_2 are equiprobable. (6)

(ii) A discrete memoryless source X has four symbols x_1, x_2, x_3 and x_4 with $P(x_1) = 0.5$, $P(x_2) = 0.25$ and $P(x_3) = P(x_4) = 0.125$. Construct a Shanon-Fanno code for X; show that this code has the optimum property that $n_i = I(x_i)$ and that the code efficiency is 100 percent. (7)

Or

(b) Consider the convolutional encoder shown in fig. 1.

(i) Find the impulse response of the encoder.

(ii) Find the output code word if the input code sequence is all 1's (1 1 1 1 1...)

(iii) Discuss the result of (ii).

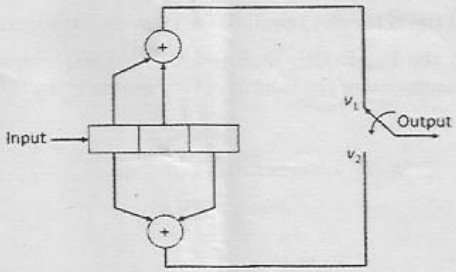

Fig. 1

15. (a) Explain the operation of FH-SS. Compare slow and fast FH-SS.

Or

(b) Discuss the FDMA and TDMA techniques used in wireless communication with their merits and demerits.

PART C — (1 × 15 = 15 marks)

16. (a) A compact disk (CD) recording system samples each of two stereo signals with a 16-bit analog-to-digital converter (ADC) at 44.1 Kb/s.

(i) Determine the output signal-to-quantization-noise ratio for a full-scale sinusoid.

(ii) The bit stream of digitized data is augmented by the addition of error-correcting bits, clock extraction bits, and display and control bit fields. These additional bits represent 100 percent overhead. Determine the output bit rate of the CD recording system.

(iii) The CD can record an hour's worth of music. Determine the number of bits recorded on a CD.

(iv) For a comparison, a high-grade collegiate dictionary may contain 1500 pages, 2 columns per page, 100 lines per column, 8 words per line, 6 letters per word, and 7 b per letter on average. Determine the number of bits required to describe the dictionary and estimate the number of comparable books that can be stored on a CD.

Or

(b) An analog signal having 4 KHz bandwidth is sampled at 1.25 times the Nyquist rate and each sample is quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.

(i) What is the information rate of this source?

(ii) Can the output of this source be transmitted without error over an AWGN channel with a bandwidth of 10 KHz and an S/N ratio of 20 dB?

(iii) Find the S/N ratio required for error-free transmission for part (ii).

(iv) Find the bandwidth required for an AWGN channel for error-free transmission of the output of this source if the S/N ratio is 20 dB.
