Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 40448

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fifth Semester

Electronics and Communication Engineering

EC 8501 – DIGITAL COMMUNICATION

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Why the theory of information is relevant for understanding the principles of digital communication systems?

2. A discrete memoryless source has an alphabet of eight letters, $x_i, i = 1,2....8$, with probabilities 0.25, 0.2, 0.15, 0.12, 0.1, 0.08, 0.05, 0.05. Determine the entropy of the source.

3. Given the data stream 11100, sketch the transmitted sequence of pulse for the unipolar non return to zero line code.

4. Draw the diagram of DPCM System.

5. List the properties of matched filter.

6. What do you mean by ISI?

7. Draw the constellation diagram of QPSK Modulation scheme.

8. Write the Bit error rate equation for BPSK Modulation scheme.

9. Consider a (7,4) cyclic code with Generator polynomial $g(p) = 1 + p^2 + p^3$. Find the codeword for the message 0111.

10. State channel coding theorem.

PART B — (5 × 13 = 65 marks)

11. (a) Derive the Shannon's third theorem - channel capacity theorem and show that the channel capacity is

$$C = B\log 2\left(1+\frac{p}{N_o B}\right)bit/s$$

Or

(b) A discrete memory less source has an alphabet of seven symbols with probabilities [0.25, 0.0625, 0.0625, 0.25, 0.125, 0.125, 0.125]. Compute the Huffman code for this source, moving a combined symbol as high as possible. Compute the efficiency of the code.

12. (a) Draw the encoding patterns for NRZ-L,NRZ-I Manchester and differential Manchester encoding techniques for the given sequences (i) 10110110 (ii) 11000101

Or

(b) Draw the delta modulation circuit and explain its operation.

13. (a) State and Prove Nyquist criterion for distortionless transmission.

Or

(b) Consider the signal shown in Figure 1.

(i) Determine the impulse response of a filter matched to this signal and sketch it as a function of time.

(ii) Plot the matched filter output as a function of time.

(iii) What is the peak value of the output?

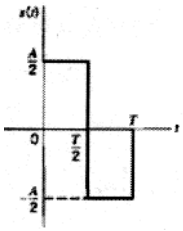

Figure 1

14. (a) Derive the bit error rate for binary frequency shift keying modulation scheme.

Or

(b) Draw the structure of Differential PSK Modulation scheme and explain its operation.

15. (a) Figure 2 depicts a rate 1/2, constraint length K = 2,convolutional code. Sketch the tree diagram, the trellis diagram and the state diagram. This convolutional code is used for the transmission over a AWGN channel with hard decision decoding. The output of the demodulator detector is (101001011...). Using the viterbi algorithm, find the transmitted sequence.

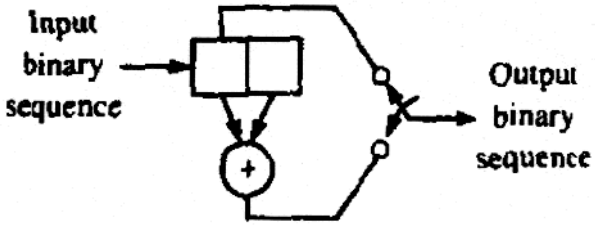

Figure. 2

Or

(b) The parity check bits of a (7,3) linear block code are generated by $c_4 = d_1 + d_2$, $c_5 = d_2 + d_3$, $c_6 = d_1 + d_2 + d_3$, $c_7 = d_1 + d_3$. where d_1, d_2 and d_3 are the message digits.

(i) Find the Generator Matrix and Parity Check Matrix for this code

(ii) Find the minimum weight of this code.

(iii) Find the error correcting capabilities of this code.

PART C — (1 × 15 = 15 marks)

16. (a) An FSK system transmits binary data at the rate of 2.5×10^6 bits/sec. During the course of transmission, white Gaussian noise of zero mean and power spectral density 10^{-20}W/Hz is added to the signal. In the absence of noise, the received sinusoidal wave for digit 1 or 0 is 1 mV. Determine the average probability of symbol error for coherent and non coherent FSK system.

Or

(b) Determine the pulse shape for the partial response signals for the following requirement:

$$x(nT) = \begin{cases} -1 & n = -1 \\ 0 & n = 0 \\ 1 & n = 1 \end{cases}$$