



B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Sixth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U18ECI6201: Communication Engineering-II

COURSE OUTCOMES

- CO1:** Demonstrate digital communication system and estimation techniques used in the receiver.
CO2: Apply and verify source coding techniques.
CO3: Apply and analyze channel coding techniques for data transmission.
CO4: Examine the interference effects in band limited communication systems.
CO5: Compare and implement the performance of various digital modulation techniques.
CO6: Describe various synchronization techniques.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

- | | | |
|---|-----|-------------------|
| 1. Sketch the model of digital communication system. | CO1 | [K ₁] |
| 2. What is the difference between the Matched Filter and the Correlation Receiver? | CO1 | [K ₂] |
| 3. Define Entropy of a source? Outline the property of entropy. | CO2 | [K ₂] |
| 4. A source produces one of four possible symbols during each interval having probabilities, $P(x_1) = 1/2$, $P(x_2) = 1/4$, $P(x_3) = P(x_4) = 1/8$. Determine the information content of each of these symbols and compute entropy of the source.. | CO2 | [K ₃] |
| 5. List the properties of cyclic codes with an example. | CO3 | [K ₂] |
| 6. Show how Trellis diagram is used to represent the code generated by convolutional coder and mention its advantages. | CO3 | [K ₃] |
| 7. Interpret the operational modes of an Adaptive Equalizer. | CO4 | [K ₂] |
| 8. Assess the features of DPSK. | CO5 | [K ₂] |
| 9. Outline the concepts of M-ary Signaling with an example. | CO5 | [K ₂] |
| 10. Sketch the block diagram of carrier synchronization using M th power loop. | CO6 | [K ₂] |

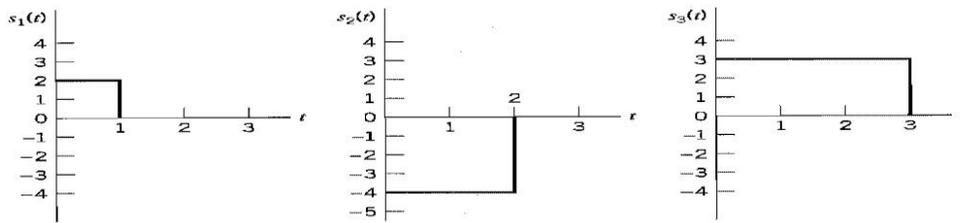
Answer any FIVE Questions:-

PART B (5 x 16 = 80 Marks)

(Answer not more than 400 words)

- | | | | |
|--|----|-----|-------------------|
| 11. a) For the signals given in the figure, find the orthonormal basis functions using | 10 | CO1 | [K ₃] |
|--|----|-----|-------------------|

Gram Schmidt orthogonalization procedure and express the signals in terms of the basis function. Construct the signal space diagram.



b) List the properties of matched filter. 6 CO1 [K₃]

12. a) Consider a sequence of symbols X with their probabilities of occurrence as given: 16 CO2 [K₃]

X	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇
p(X)	0.4	0.2	0.12	0.08	0.08	0.08	0.04

Compute Huffman and Shannon Fano codes for these symbols and determine the following:

- i. Entropy of the source
- ii. Average length of the code
- iii. Code efficiency

and Compare their performances.

13. a) Consider a (7,4) linear block code defined by the generator matrix. 10 CO3 [K₃]

$$\vec{G} = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

- (a) Determine the parity check matrix.
- (b) Find the encoding table for the linear block code.
- (c) What is the minimum distance d_{min} of the code. How many errors can the code detect and correct ?
- (d) Suppose $\vec{c} = [1 \ 0 \ 0 \ 1 \ 0 \ 1 \ 1]$ is sent and $\vec{r} = [1 \ 1 \ 0 \ 1 \ 0 \ 1 \ 1]$ is received. Show how the code can correct this error.

b) Consider a 1/2 rate convolutional encoder described by matrices the generator $g_1(100), g_2(101)$. Draw the encoder and encode the sequence $\{1,1,1,0,1,0,0\}$ 6 CO3 [K₃]

14. a) Deduce the expression for Nyquist criteria for distortion less baseband transmission for zero ISI. Give ideal and practical solutions for zero ISI. 10 CO4 [K₃]
- b) The binary data 001101 are applied to the input of a duo binary system. Construct the duo binary coder output and corresponding receiver output with and without precoding. 6 CO4 [K₃]
15. a) Explain the concept of coherent BPSK transmitter and receiver with block diagrams and obtain the expression for probability of error 16 CO5 [K₂]
16. a) What is the need for carrier synchronization. Explain how the Costas loop is applied in the context of carrier synchronization? 8 CO6 [K₃]
- b) Justify the necessity of synchronization in digital communication. Discuss in detail how symbol synchronization is achieved in binary receiver. 8 CO6 [K₂]
