

15 JUN 2023

Reg. No.

Question Paper Code

11890

B.E./B.Tech. - DEGREE EXAMINATIONS, APRIL/MAY 2023

Fifth Semester

Electronics and Communication Engineering
20ECPC501 - DIGITAL COMMUNICATION
(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | <i>Marks,
K-Level, CO</i> |
|---|-------------------------------|
| 1. State the properties of entropy. | 2,K2,CO1 |
| 2. Define information rate. | 2,K2,CO1 |
| 3. What is the channel capacity of a BSC and BEC? | 2,K2,CO2 |
| 4. Define Shannon's channel coding theorem. | 2,K2,CO2 |
| 5. What is Line coding? | 2,K2,CO3 |
| 6. State the principle of model based encoding. | 2,K2,CO3 |
| 7. Define Duo binary encoding. | 2,K1,CO4 |
| 8. Compare a matched filter and a correlation receiver. | 2,K2,CO4 |
| 9. Define carrier synchronization. | 2,K1,CO5 |
| 10. What are cyclic codes? Mention its properties. | 2,K1,CO6 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) (i) Write short notes on Information and its properties. 7,K2,CO1
(ii) Explain source coding theorem (Shannon's first theorem) in detail. 6,K2,CO1
- OR**
- b) (i) A voice grade telephone channel has a bandwidth of 3400Hz. If the SNR on the channel is 30 db, determine the capacity of the channel. If the above channel is to be used to transmit 4.8Kbps of data determine the minimum SNR required on the channel. 6,K2,CO1
(ii) Explain in detail about Discrete memory less channel. 7,K2,CO1
12. a) A DMS has six symbols $x_1, x_2, x_3, x_4, x_5, x_6$ with probability of emission 0.2,0.3,0.11,0.16,0.18,0.05 encode the source with Huffman and Shannon –fano codes compare its efficiency. 13,K3,CO2

OR

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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- b) (i) A discrete memory less source has an alphabet of five symbols with their probabilities for its output as given here 8,K3,CO2
 $[X] = [x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5]$
 $P[X] = [0.45 \quad 0.15 \quad 0.15 \quad 0.10 \quad 0.15]$
 Determine average code word length, code efficiency and its variance.
 (ii) Explain Huffman coding with a suitable example. 5,K2,CO2

13. a) (i) What is the need for Adaptive Delta Modulation and how it overcomes the drawback of delta modulation? 5,K2,CO3
 (ii) Explain the features of adaptive delta modulation with transmitter. 8,K2,CO3

OR

- b) Explain in detail about Adaptive Differential pulse code modulation (ADPCM) with neat diagram. 13,K2,CO3

14. a) Explain how Nyquist criterion eliminates interference in the absence of noise for distortionless baseband binary transmission. 13,K2,CO3

OR

- b) (i) Explain modified Duobinary signaling scheme with a neat diagram. 7,K2,CO4
 (ii) Summarize the properties of the matched filter in detail. 6,K2,CO4

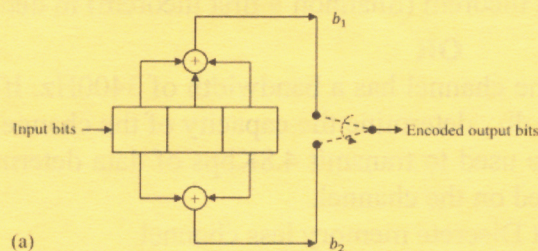
15. a) Draw the transmitter, receiver block diagram of QPSK and explain its signal space diagram in detail. 13,K2,CO5

OR

- b) Draw the transmitter, receiver block diagram of BFSK and explain its signal space diagram in detail. 13,K2,CO5

PART - C (1 × 15 = 15 Marks)

16. a) (i) Draw the code tree of a Convolutional code of code rate $r = 1/2$ and constraint length of $K = 3$ starting from the state table and state diagram for an encoder shown in the Figure 1. 9,K3,CO6



(a)
Figure 1

- (ii) Draw and explain the trellis diagram representation of convolution codes. 6,K3,CO6

OR

Consider a linear block code with generator matrix

15.K3.CO6

- b) $1\ 1\ 0\ 1\ 0\ 0\ 0$
 $0\ 1\ 1\ 0\ 1\ 0\ 0$
 $1\ 1\ 1\ 0\ 0\ 1\ 0$
 $1\ 0\ 1\ 0\ 0\ 0\ 1$

- (i) Construct the parity check matrix.
- (ii) Write the code vectors.
- (ii) Trace the error detecting and capability of the code.
- (iii) Draw the encoder and syndrome calculation circuits.
- (iv) Write the syndrome for the received vector $r = [1\ 1\ 0\ 1\ 0\ 1\ 0]$.