KUMARAGURU
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B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Sixth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U18ECI6201: Communication Engineering - II

COURSE OUTCOMES

CO1: 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. List the challenges that the digital communication system encountered with its implementation. CO1 [K3]

2. Recall Source Coding Theorem. CO2 [K2]

3. For an AWGN channel with 5KHz bandwidth and noise PSD $N0/2 = 10^{-11}$ W/Hz, the signal power required at the receiver is 0.2mW. Calculate the Capacity of this channel. CO2 [K3]

4. For a systematic (7, 4) cyclic code with generator polynomial $g(x)= 1+x+x3$. Determine the syndrome for received codeword 1111111. CO3 [K3]

5. Recall the G and H matrix for a (5,4) parity check code. CO3 [K3]

6. Determine the transmission bandwidth of the channel, if raised cosine pulse with a roll-off rate of 0.5 is used at a 10 Mbps data rate. CO4 [K3]

7. What is the advantage of correlative-level coding? CO4 [K2]

8. Compare BFSK and BPSK. CO5 [K3]

9. How does MSK differ from BFSK? CO5 [K3]

10. What is the need for carrier synchronization? CO6 [K2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) Construct orthonormal basis functions for the following three signals using Gram Schmidt Orthogonalization procedure and express each of these signals in terms of the set of basis functions.   10   CO1   [K₃]
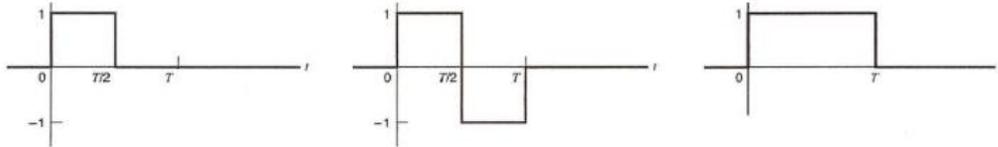
    b) Derive the impulse response of the Matched filter for the signal to be matched   6   CO1   [K₂]

12. a) Encode the following source using Huffman coding procedures and the Shannon-Fano procedure. calculate the average code length, efficiency, and redundancy of the codewords derived. Compare the results.   16   CO2   [K₃]

X	x1	x2	x3	x4	x5	x6	x7
p(X)	0.4	0.2	0.12	0.08	0.08	0.08	0.04

13. a) Consider the G matric given below for a (7,4) Block code.   10   CO3   [K₃]

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

     a) Find all the codewords generated using the generator matrix.
     b) Determine the error correction and detection capability of the code.
     c) Write the syndrome versus error pattern table.

    b) The binary data 10110001 is applied to the input of a duo binary system.   6   CO4   [K₃]

     a) Construct the duo binary coder output and corresponding receiver output, without a precoder.
     b) Suppose that due to an error during transmission, the level at the receiver input produced by the third digit is reversed. Construct the new receiver output.
     c) Repeat the above two cases using the precoder.

14. a) A rate 1/2 convolutional encoder with constraint length 3 is described by $g^{(1)}$= [1 1 1] and $g^{(2)}$=[1 0 1].   12   CO3   [K₃]

     i. Draw the encoder and encode the sequence [1 0 1]
     ii. Draw the state transition diagram and trellis diagram.
     iii. Decode the sequence obtained in question i. using the Viterbi algorithm.

b)	Draw the signal space diagram of QPSK and illustrate the working of the transmitter and receiver using block diagrams.	4	CO5	[K$_2$]

15. a) Obtain the expression for Nyquist criteria for distortionless baseband transmission for zero ISI and discuss the ideal and practical solutions. 10 CO4 [K$_2$]

   b) Derive the probability error for the BPSK signals over an AWGN channel. 6 CO5 [K$_L$]

16. a) Determine the DPSK signal phase for the following data sequence 1 1 1 0 0 1. Illustrate the working of the DPSK transmitter and receiver using the block schematic. 8 CO5 [K$_3$]

   b) What is the purpose of the early-late technique? Explain the operation in detail. Demonstrate any one carrier synchronization technique. 8 CO6 [K$_2$]

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