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Question Paper Code : 70436

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

Fifth Semester

Electronics and Communication Engineering

EC 6501 – DIGITAL COMMUNICATION

(Regulations 2013)

(Common to PTEC 6501 – Digital Communication for B.E. (Part-Time) Electronics and Communication Engineering – Fourth Semester (Regulations –2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. A certain lowpass bandlimited signal x(t) is sampled and the spectrum of the sampled version has the first guard band from 1500 Hz to 1900 Hz. What is the sampling frequency? What is the maximum frequency of the signal?

2. What is companding? Sketch the characteristics of a compander.

3. What is the need of prediction filtering?

4. How to overcome the slope overlap?

5. What is ISI?

6. What is equalization?

7. Draw the BER curve for ASK, FSK and BPSK digital modulation schemes.

8. Obtain the orthonormal basis function for the signal,

$$s_1(t) = \begin{cases} \sqrt{\frac{2E_b}{T_b}} \cos(2\pi f_c t); & 0 \le t \le T_b \\ 0 & ; 0 \le t \le T_b \end{cases}$$

9. State channel coding theorem.

10. List the properties of cyclic codes.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Illustrate and describe the types of quantizer. Describe the midtread and midrise type characteristics of uniform quantizer with a suitable diagram. (13)

Or

(b) Draw and explain the TDM with its applications. (13)

12. (a) (i) With relevant block diagram, explain the DPCM system.

(ii) Explain in detail about linear predictive coding.

Or

(b) (i) With a block diagram, describe delta modulation.

(ii) Describe ADPCM.

13. (a) Derive the power spectral density of unipolar NRZ data format and list its properties

Or

(b) (i) Describe the Nyquist's criteria for distortionless base band transmission. (8)

(ii) What is a "raised Cosine spectrum"? Discuss how does it help to avoid ISI? (5)

14. (a) Derive the expression for a maximum likelihood detector and prove that the ML detector reduces to minimum distance detector for the special case of white-Gaussian noise vector channel.

Or

(b) Derive the probability of error for PSK signaling scheme.

15. (a) For a systematic linear block code, the three parity check digits P_1, P_2, P_3 are given by $Pk_{n-k} = \begin{bmatrix} 101 \\ 111 \\ 110 \\ 011 \end{bmatrix}$.

(i) Construct generated matrix

(ii) Construct code generated by the matrix

(iii) Determine error correcting capacity

(iv) Decode the received words with an example. (13)

Or

(b) A convolution code is described by $g1 = [1\ 0\ 0]$; $g2 = [1\ 0\ 1]$; $g3 = [1\ 1\ 1]$

(i) Draw the encoder corresponding to this code

(ii) Draw the state transition diagram for this code

(iii) Draw the Trellis diagram

(iv) Find the transfer function. (13)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Illustrate the transmitter, receiver and signal space diagram of quadrature phase shift keying.

(ii) Derive probability of symbol error with neat sketch and calculate the same when Eb/No equal 2 units.

Or

(b) Consider a linear block code with generator matrix.

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

(i) Determine the parity check matrix. (2)

(ii) Determine the error detecting and capacity of the code. (3)

(iii) Draw the encoder and syndrome calculation circuits. (6)

(iv) Calculate the syndrome for the received vector $r = [1101010]$ and identify the error corrected vector. (4)

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