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328554(28)

B. E. (Fifth Semester) Examination, April-May 2021

(New Scheme)

(Et & T Branch)

DIGITAL COMMUNICATION

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) is compulsory from each question & carries 2 marks. Attempt any* ***two*** *parts of part (b), (c) and (d) of each question & carrying 7 marks.*

Unit-I

1. (a) An audio signal, $s(t) = 3\cos(2\pi\ 500t)$ is quantized using 10 bit PCM. Determine signal to quantization noise ratio?

(b) State and proof low pass sampling theorem.

(c) Explain the process of digital multiplexing using T1, T2, T3 and T4 lines.

(d) A signal $x_1(t)$ is bandlimited to 3 kHz. There are three more signals $x_2(t)$, $x_3(t)$ and $x_4(t)$ which are bandlimited to 1 kHz each. This signals are to be transmitted by a TDM system.

(i) Design a TDM scheme where each signal is sampled at its Nyquist rate.

(ii) What must be the speed of the commutator?

(iii) Calculate the minimum transmission bandwidth of the channel.

Unit-II

2. (a) What is Quantization?

(b) A PCM system uses a uniform quantizer followed by a v bit encoder. Show that the RMS signal to quantization noise ratio is approximately given as $(1{\cdot}8 + 6\,v)$ dB.

(c) Explain the working principal of Delta modulator

with the help of suitable block diagram.

(d) Derive an expression for signal to noise ratio in Delta modulator.

Unit-III

3. (a) State the condition for Nyquist criterion for zero ISI.

(b) Derive an expression for PSD of Unipolar signal.

(c) Derive an expression for detection error probability of polar signal.

(d) Assuming the initial content of all the shift registers of the scrambler of fig. to be zero, find the output sequence Y for an input sequence X given by $X =$ 101010111111.

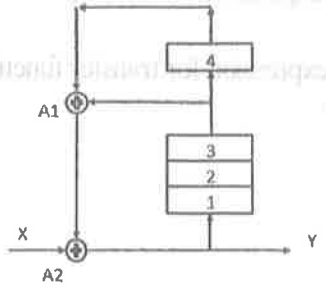

Fig. Scrambler

Unit-IV

4. (a) List the various factor affecting the choice of line code.

   (b) The bit stream 0010010011 is to be transmitted using DPSK. Determine encoded sequence and detected binary sequene.

   (c) Explain the generation and detection of BPSK.

   (d) Explain generation and detection of QPSK.

Unit-V

5. (a) Compare Gaussian noise and white noise.

   (b) Derive an expression for probability of error of Match filter receiver.

   (c) Derive an expression for error probability of BPSK.

   (d) Derive an expression for transfer function of optimum filter.