328554(28)

BE (5th Semester)
Examination, Nov.-Dec., 2017

[New Scheme]

Digital Communication

Time Allowed : 3 hours *Maximum Marks* : 80
Minimum Pass Marks : 28

Note : (*i*) Part (*a*) of each question is compulsory. Attempt any **two** parts from (*b*), (*c*) and (*d*).

(*ii*) The figures in the right-hand margin indicate marks.

1. (*a*) What is the necessity of non-uniform quantization? [2]

(*b*) State and prove base-band sampling theorem. [7]

(*c*) A PCM system uses a uniform quantizer followed by a v bit encoder. Show that RMS signal-to-quantization noise ratio is approximately given as $(1.8 + 6v)$ dB. [7]

(*d*) Design a digital carrier system, consisting of T1, T2, T3 and T4 multiplexed lines. [7]

(Turn Over)

2. (*a*) An audio signal, $x(t) = 3\cos(2\pi 500t)$ is quantized using 10-bit PCM. Determine signal-to-quantization noise ratio. [2]

(*b*) Describe delta modulation. Explain how the DM transmitter functions. [7]

(*c*) Show that for uniform quantizer with a given dynamic range, if the number of quantization levels is doubled then signal-to-quantization noise power increases by 6 dB. [7]

(*d*) Derive an expression for signal to noise ratio in DM. [7]

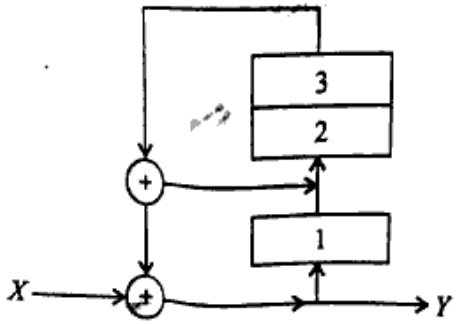
3. (*a*) List the various factors affecting the choice of line code. [2]

(*b*) A delta modulator system is designed to operate at five times the Nyquist rate for a signal with 3 kHz bandwidth. Determine the maximum amplitude of 2 kHz input sinusoid for which the delta modulator does not have slope over load. Quantizing step size is 250 mV. Derive the formula that you use. [7]

(*c*) Explain the Nyquist criterion for zero ISI. [7]

(Continued)

(*d*) The data stream $X = 10101010000111$ is fed to the scrambler. Determine the output (Y) of the scrambler and design the corresponding descrambler. [7]



4. (*a*) For the input sequence 110100011 explain the encoding and decoding process when DPSK is used. [2]

(*b*) Explain the generation and detection of QPSK. [7]

(*c*) Explain the generation and detection of FSK. [7]

(*d*) With the help of block diagram (transmitter and receiver), explain the principle of a differential phase shift keying. Illustrate the generation of DPSK signal with an example sequence.

5. (*a*) What is optimum filter? [7]

(*b*) What is match filter? Calculate error probability of optimum filter. [2]

[7]

(*c*) What is the concept of optimum receiver? Explain the fundamental of optimum receiver. [7]

(*d*) Calculate the probability of error for BPSK, BFSK and QPSK. [7]