4E4164

Roll No.

Total No of Pages: 4

4E4164

B. Tech. IV Sem. (Main) Exam., June/July-2014

Computer Science and Engineering

4CS5A Fundamental of Communication

Common with IT

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1._____ 2._____

UNIT-I

Q.1. (a) Explain the generation of amplitude modulated signal using square law modulator. Draw the spectrum of the output of square law modulator. [8]

(b) An angle modulated signal is given by $x_c(t) = 6 \text{ Cos } [2\pi \times 10^7 t + 0.2 \sin(10^4) \pi t]$.

(i) If $x_c(t)$ is phase modulated signal with $k_p = 5$ rad / volt; and

(ii) If $x_c(t)$ is frequency modulated signal with $k_f = 5 \times 10^2$ Hz / volt

In each case, determine the modulating signal x(t). [8]

OR

Q.1. (a) Calculate the percentage power saving when the carrier and one of the sidebands are suppressed in an AM wave modulated to a depth of (i) 100% (ii) 50%. [8]

(b) With the help of a block diagram, explain the FM demodulation method using phase locked loop (PLL). [8]

UNIT-II

Q.2. (a) State and prove the sampling theorem for low-pass signals. [8]

(b) A signal $m_1(t)$ is bandlimited to 3.6 kHz and three other signals - $m_2(t)$, $m_3(t)$, $m_4(t)$ are bandlimited to 1.2 kHz each. These signals are to be transmitted by mean of time-division multiplexing (TDM).

(i) Set up a scheme for accomplishing this multiplexing requirement, with each signal sampled at its Nquist rate.

(ii) What must be the speed of the commutator (in samples per second)? [8]

OR

Q.2. (a) The signal $x(t) = 2 \cos 200\pi t + 6\cos 180\pi t$ is ideally sampled at a frequency of 150 samples per sec. The sampled version is passed through a unit gain ideal low – pass filter (LPF) with cut–off of 110Hz. What frequency component will be present in the output of the LPF? Write down an expression for its output signal. [8]

(b) Explain the method of generation and detection of pulse – portion modulated (PPM) signal. [8]

UNIT-III

Q.3. (a) A PCM system uses a step size of Δ. Assuming quantization error is uniformly distributed, determine the mean square value of the quantization error. Also find the signal-to-quantization noise ratio for an n-bit binary PCM with a sinusoidal message signal. [8]

(b) With the help of block diagram explain the working of a Delta modulator (DM) transmitter and receiver. [8]

OR

Q.3. Derive the expression for the average probability of error for a binary encoded PCM receiver using matched filter. Assume that PCM wave uses the NRZ unipolar format E_{max} and T_b are peak signal energy and bit duration respectively. Channel noise is AWGN (additive white Gaussian noise) with zero mean and power spectral density No/2. [16]

UNIT-IV

Q.4. (a) Derive the equation of Nyquist criterion for distortionless baseband transmission in the absence of noise. [8]

(b) With the help of block diagram explain the coherent detection of binary FSK signal. [8]

OR

Q.4. (a) What do you mean by ISI in baseband transmission? Explain the methods to minimize ISI. [8]

(b) Derive the expression of average probability of symbol error for binary PSK using coherent detection. [8]

UNIT-V

Q.5. (a) List and explain the properties of Pseudo noise (P N) sequences. [8]

(b) In a DS/BPSK system, the feedback shift register used to generate the PN sequence has length m=19. The system is required to have a probability of error that does not exceed 10^{-5} (E_b/N_o=10). Calculate the following system parameters in decibels:

(i) Processing gain

(ii) Antijam margin [8]

OR

Q.5. (a) Explain the concept of processing gain in frequency-hop spread spectrum (FHSS). Draw the block diagram of FHSS/M-ary FSK transmitter and receiver. [8]

(b) Write a short note on applications of spread-spectrum modulation. [8]
