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| <b>4E4164</b>  | Roll No. | <b>4E4164</b> | Total No of Pages: <span style="border: 1px solid black; padding: 2px;">4</span> |
| <p><b>B. Tech. IV Sem. (Main) Exam., June/July-2014</b><br/> <b>Computer Science and Engineering</b><br/> <b>4CS5A Fundamental of Communication</b><br/> <b>Common with IT</b></p> |          |               |  |

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  $x_c(t) = 6 \cos [2\pi \times 10^7 t + 0.2 \sin(10^4) \pi t]$ .

(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 Nyquist 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 – position modulated (PPM) signal. [8]

### UNIT-III

- Q.3. (a) A PCM system uses a step size of  $\Delta$ . 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  $N_0/2$ . [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]

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