B. TECH.

FOURTH SEMESTER EXAMINATION, 2001-2002

FUNDAMENTALS OF COMPUTER COMMUNICATION SYSTEM

Time : Two Hours *Total Marks : 50*

Note : Attempt ALL questions.

1. Attempt any THREE of the following :— (4·5x3)

(*a*) Explain and differentiate Amplitude modulation, Frequency modulation and Phase modulation. In an AM-SC system, the modulating signal is a single-tone sinusoid $E_m \cos \omega_m t$ which modulates a carrier signal $E_C \cos \omega_C t$. Plot the spectrum of the modulated wave.

(*b*) Explain the terms Information and Entropy. An event has six possible outcomes with the probability $p_1=1/2$, $p_2= 1/4$, $p_3 = 1/8$, $p_4 = 1/16$, $p_5=1/32$ and $p_6=1/32$. Find the entropy of the system. Also find the rate of information if there are 16 outcomes per second.

(*c*) What is pulse modulation system ? Also explain the various types of pulse modulation systems.

(*d*) A transmitter has an alphabet of four letters $[x_1\ x_2\ x_3\ x_4]$ and the receiver has an alphabet of three letters $[y_1\ y_2\ y_3]$. The joint probability matrix is

$$P(x,y) = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \\ x4 \end{array} \begin{array}{c} \begin{array}{ccc} y_1 & y_2 & y_3 \end{array} \\ \begin{bmatrix} 0{\cdot}3 & 0{\cdot}05 & 0{\cdot}0 \\ 0{\cdot}0 & 0{\cdot}25 & 0{\cdot}0 \\ 0{\cdot}0 & 0{\cdot}15 & 0{\cdot}05 \\ 0{\cdot}0 & 0{\cdot}05 & 0{\cdot}15 \end{bmatrix} \end{array}$$

Calculate all the Entropies.

(*e*) What is coding efficiency? Consider a source alphabet of A, B, C, D, E, F, G, H having probabilities

$P(X_i) = \{1/2,\ 1/4,\ 1/16,\ 1/16,\ 1/32,\ 1/32,\ 1/32,\ 1/32\}$

Design the Shannon's fano code and calculate the code efficiency.

2. Attempt any THREE of the following :— (4·5x3)

(*a*) What is dubinary baseband PAM System ? Explain in detail.

(*b*) Draw the block diagram of Scrambler and Unscrambler. Also explain the working of Scrambler and Unscrambler.

(*c*) Explain in detail the M-ary signaling scheme.

(*d*) Explain and compare Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK) and Phase Shift Keying (PSK).

(*e*) Write short notes on the following :—

(*i*) Inter symbol interface

(*ii*) Coherent and non-coherent detectors

3. Attempt any TWO parts of the following :— (5·5x2)

(*a*) What do you understand by linear block codes. The generator matrix for a (6,3) block code is given below. Find all the code words of this code :—

$$G = \begin{bmatrix} 100 & : & 110 \\ 010 & : & 011 \\ 001 & : & 111 \end{bmatrix}$$

(*b*) Explain the role of cyclic codes in communication system. The generator polynomial of a (7, 4) cyclic code is $g(x) = 1 + x + x^3$. Find the 16 code words of this code.

(*c*) What do you mean by Hamming distance ? Also write the procedure to generate Hamming's code for single error detection and correction.

4. Attempt any TWO of the following :— (6x2)

(*a*) Explain Synchronous Communication and differentiate it with Asynchronous Communication. Also differentiate Packet Switching and Circuit Switching and explain the process of Hybrid Switching.

(*b*) Explain ISO-OSI Reference model for Computer Network and compare it with TCP/IP model. How is Physical Address converted into IP address and vice-versa ? Write also the name of protocol by which these can be done.

(*c*) Write short notes on the following :—

(*i*) ISDN

(*ii*) ATM

(*iii*) Bridge, Router, Gateway

(*iv*) Modem