Printed Pages : 7 **TEC – 601**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3091 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) EXAMINATION, 2007-08

DIGITAL COMMUNICATION

Time : 3 Hours] *[Total Marks : **100***

Note : *(1) Attempt **all** questions.*

*(2) **All** question carry **equal** make.*

*(3) In case of **numerical** problems assume **data** wherever not provided.*

1 Attempt any **four** parts of the following : **5x4=20**

(a) What is mutual information? How is it related to channel capacity?

(b) What is 'Prefix Coding'? Explain with the help of suitable example. Write the equation of Kraft-McMillan In equality and also state the application.

(c) Draw the block diagram of Digital communication transmission and receiver system and explain the each block.

(d) A source produces six message with probabilities $\frac{1}{4}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{1}{8}$ and $\frac{1}{8}$ respectively. Obtain the information content of each message and the entropy of the source.

(e) A discrete memoryless source has an alphabet of seven symbols whose probabilities of occurrence are as follows:

Symbol	S_0	S_1	S_2	S_3	S_4	S_5	S_6
Pr*obability*	0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

Determine the Huffman code for above source.

(f) Consider 8 alphabet source with probability of occurrence as follows:

Symbol	A	B	C	D	E	F	G	H
Probability	0.30	0.20	0.15	0.12	0.10	0.07	0.04	0.02

According to Shannon-Fano techniques, generate the binary codes.

2 Attempt any **four** parts of the following : **5x4=20**

(a) Explain why quantization noise could effect small amplitude signals in a PCM system for more than large signals.

(b) What is companding? Why is it used? Illustrate your answer with a sketch of companding curves.

(c) What is Delta modulation? Explain the limitations of Delta modulation with suitable diagram.

(d) What is the slope overload distortion and granular noise in Delta modulation and how is it removed in Adaptive Delta Modulation?

(e) Define the following types of line codes for the electrical representations of binary data.

(i) Unipolar NRZ signalling

(ii) Bipolar RZ signalling

(iii) Split-phase.

(f) Prove that the output signal of a matched fileter is proportional to a shifted version of the Autocorrelation function of the input signal to which the filter is matched.

3 Attempt any **two** parts of the following : **10x2=20**

(a) (i) What do you understand by Intersymbol Interference (ISI)?

(ii) Explain the generation and detection of Ask, with neat block diagram.

(b) Draw the block diagram of DPSK transmitter and receiver. The binary sequence 11001000 is applied to the DPSK transmitter.

(i) Sketch the resulting wave form at the transmitter output.

(ii) Applying this wave form to the DPSK receiver. Show that, in the absence of noise, the original binary sequence is reconstructed at the receiver output.

(c) Explain the condition of orthogonality of the two BFSK signals and the signal space diagram for the orthogonal signal. Derive an expression for the probability of error in synchronous detection of the BFSK signal using matched filter.

4 Attempt any **two** parts of the following : **10x2=20**

(a) Draw the block diagram of FSK system and explain the operating principle.

An FSK system transmits binary data at the rate of 2.5×10^6 bits per second. During the course of transmission, white Gaussian noise of zero mean and power spectral density 10^{-20} W/Hz is added to the signal. In the absence of noise the amplitude of the received sinusoidal wave for digit 1 or 0 is 1 mv.

Determine the average probability of symbol error for the following system configurations.

(i) Coherent binary FSK

(ii) Non coherent binary FSK

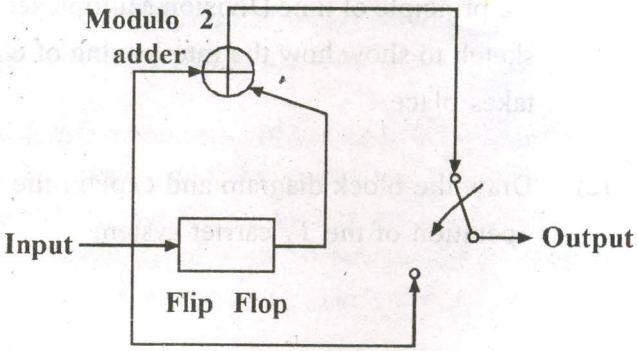
(b) What is multiplexing? Why is it needed? Explain the principle of time Division Multiplexer with a sketch to show how the interleaving of channels takes place.

(c) Draw the block diagram and explain the working operation of the T_1 carrier system.

5 Attempt any **two** parts of the following : **10x2=20**

(a) Consider the (7,4) Hamming code defined by the generator polynomial $g(x) = 1 + x + x^3$. The code word 0111001is sent over a noisy channel, producing the received word 0101001 that has a single error. Determine the syndrome polynomial s(x) for this received word and show that it is identical to the error polynomial $I(x)$.

(b) (i) Consider the rate $r = \frac{1}{2}$, constraint length $k = 2$ conventional encoder of the following figure. The code is systematic. Find the encoder output produced by the message sequence 10111.



(ii) Construct the code tree for the conventional encoder of above figure. Trace the path through the tree that corresponds to the message sequence 10111.

(c) A (7,4) linear block code is generated according to the following parity check matrix.

$$[H] = \begin{bmatrix} 1\,1\,1\;0\,1\,0\,0 \\ 1\,1\,0\;1\,0\,1\,0 \\ 1\,0\,1\;1\,0\,0\,1 \end{bmatrix}$$

The received denoted codeword Y is 1000011 for a transmitted code Word X. Find the corresponding data transmitted.
