Printed Pages : 4

EEC601

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

PAPER ID : 2487

Roll No. | | | | | | | | | | |

B.Tech.

(SEMESTER-VI) THEORY EXAMINATION, 2012-13

DIGITAL COMMUNICATION

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

SECTION – A

1. Attempt **all** questions. **10 × 2 = 20**

(a) Explain why digital communication is preferred over analog communications.

(b) A voice grade channel of the Telephone Network has a bandwidth of 3.4 kHz. Calculate the channel capacity of the telephone channel for a signal to noise ratio of 30 dB.

(c) Why power control is needed in CDMA ?

(d) Define orthogonal signalling.

(e) Define Null-to-null Bandwidth of the transmitted signal.

(f) Explain geometric interpretation of signals.

(g) Calculate the channel capacity of the telephone channel of 3.4 kHz for a signal to noise ratio of 30 dB.

(h) Purpose of Eye diagram in digital communication.

(i) State Bays' Theorem and its purpose.

(j) Write different methods for Timing synchronization in digital receiver.

SECTION – B

2. Attempt any **three** questions : **3 × 10 = 30**

(a) With the help of block diagram, explain the signal processing operations involved in a digital communication system.

(b) Explain the working principle of direct sequence spread spectrum system. Discuss its applications in detail.

A slow FH/MFSK system has following parameters :

The number of bits per MFSK symbol = 4

The number of MFSK symbols per hop = 5

Calculate the processing gain of the system in decibels.

(c) We are required to transmit 2.08×10^6 binary digits per second with $P_b \leq 10^{-6}$. Two possible schemes are considered :

(i) Binary

(ii) 16-ary ASK

The channel noise PSD is $S_n(\omega) = 10^{-8}$. Determine the transmission bandwidth and the signal power required at the receiver in each case.

(d) An audio signal of bandwidth 4 kHz is sampled at a rate 25% above the Nyquist rate and quantized. Quantisation error is not to exceed 0.1% of the signal peak amplitude. The resulting quantized samples are now coded and transmitted by 4-ary pulses.

(i) Determine minimum number of 4-ary pulses required to encode each pulse.

(ii) Determine minimum transmitted bandwidth required to transmit this data with zero ISI.

(e) (i) In an experiment, a trial consists of four successive tosses of a coin. If we define a random variable x as number of head appearing in a trial, determine Px(x) and Fx(x).

(ii) State Central Limit Theorem and explain purpose of this theorem.

(f) (i) Consider a noiseless channel with m input symbols and m output symbols as shown in Fig. 1. Show that

$H(X) = H(Y)$

$H(Y/X) = 0$

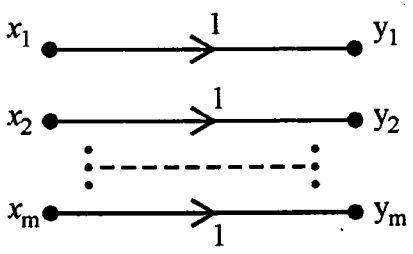

Fig. 1

(ii) Define the term burst error and error detection. How many redundancy checks are used in data communication ?

SECTION – C

Attempt **all** questions. **5 × 10 = 50**

3. Explain correlation receiver with a neat block diagram. Explain the function of each block. Also explain why the correlator receiver is called as integrated and dump filter. **10**

OR

Prove maximum output SNR of a matched filter is $(SNR)_0 = 2E/N_0$.

4. Plot and compare the probabilities of error for non coherent detection of Binary ASK, Binary FSK and Binary DPSK. **10**

OR

Compare the probability of two Networks of Fig. 2. The probability of links s_1 and s_2 is p each.

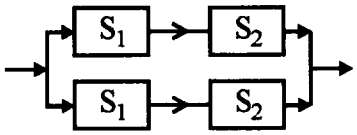

Fig. 2 (i)

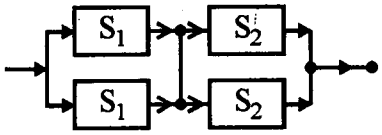

Fig. 2 (ii)

5. Explain principle of DSSS-CDMA. Derive an expression for the probability of error of a DSSS using PSK. **10**

OR

Explain generation of FHSS with suitable block diagram. Show that advantages of FHSS lies in its ability to combat jamming.

6. With the help of suitable block diagram, explain the working of QPSK coherent receiver. Sketch the QPSK waveform for sequence 111001010010, assuming **10**

(i) Carrier frequency to be equal to bit rate.

(ii) Carrier frequency is half the bit rate.

OR

Find the error probability for the multi-amplitude signalling and hence define the relationship between power and bandwidth of the same.

7. For a given generator polynomial $g(x) = 1 + x + x^3$ **10**

(i) Find the Generator matrix G for a symmetric (7, 4) cyclic code.

(ii) Find systematic cyclic code for message bits 1010.

OR

A convolution encoder has two shift registers two modulo-2 adders and an output multiplexer. The generator sequences of the encoder are as follows : g(1) = (1, 0, 1); g(2) = (1, 1, 1). Assuming a 5 bit message sequence is transmitted. Using the state diagram and the message sequence when the received sequence is (11, 01, 00, 10, 01, 10, 11, 00, 00, ...)