Printed Pages: 6 NEC-602/EEC-601

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

Paper ID : 131612 Roll No. | | | | | | | | | |

B.TECH.

Theory Examination (Semester-VI) 2015-16

DIGITAL COMMUNICATION

Time : 3 Hours *Max. Marks : 100*

Section-A

Q.1. Attempt all parts. All parts carry equal marks. Write answer of each part inshort. (2×10=20)

(a) Draw the Block diagram of digital receiver.

(b) Why the pulse shaping is more direct and potent feature in terms of shaping the PSD?

(c) Binary data at 9600 bits/s are transmitted using 8-ary PAM modulation with a system using a raised cosine roll-off filter characteristics. The system has a frequency response out to 2.4 kHz. Calculate symbol rate and roll off factor.

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(d) Justify that 1SI is not noise.

(e) Define the Commutative distribution function (CDF).

(f) A high resolution black & white pictures consist of about $2*10^6$ picture elements & 16 different brightness levels. Pictures are repeated at the rate of 32 per sec. All picture elements are assumed to be independent & all levels have equal likelihood of occurrence. Calculate the average rate of information conveyed by this TV picture source.

(g) Explain the importance of probability of error.

(h) Why the Matched filter is optimum filter?

(i) How the spread spectrum system is different from conventional modulation system?

(j) What is manchester coding?

Section-B

Q2. Attempt any five questions from this section. (10×5=50)

(a) List the properties of line coding.

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Draw the following data formats for the data bit stream 1100110.

(i) Unipolar RZ

(ii) AMI

(iii) NRZ(M)

(b) With the help of block diagram, explain QPSK coherent digital carrier system. Sketch the QPSK waveform for the sequence 1101010010, assuming the carrier frequency to be equal to the bit rate.

(c) Why the Gaussian distribution is widely used in Communication?

In an experiment, a trial consists of 4 successive tosses of a coin. If we define a Random Variable X as the number of heads appearing in a trial, determine $P_x(x)$ and $F_x(x)$.

(d) Show that impulse response of a matched filter is proportional to an inverted and shifted version of the input signal to which filter is matched.

(e) Draw the block diagram of DSSS system and explain the importance of PN sequence in DSSS.

(f) Write short notes on

(i) MUD

(ii) OFDM.

(g) Define and list the properties of Autocorrelation. Show that the random process $X(t)=A\cos(\omega_c t+\theta)$, where θ is a random variable uniformly distributed in the range $(0,2\pi)$ is a wide sense stationary process.

(h) A binary source produces 0's and 1's independently with probabilities $P(0)=0.2$ and $P(1)=0.8$. The binary data is then transmitted over a noisy channel. The probability of correct reception when a '0' has been transmitted is 0.9 and the probability of erroneous reception when '1' has been transmitted is 0.2.

(i) Find the probabilities of erroneous reception when a '0' is transmitted and probability of correct reception when a '1' was transmitted.

(ii) Find the over all probability of receiving a '0' and a '1'.

(iii) If a '1' is received, what is the probability that a '0' was transmitted.

Section-C

Note: Attempt any two questions from this section.

(15×2=30)

Q3. (a) Define the entropy of a discrete memoryless source emitting M symbols and discuss the properties of entropy.

(b) A zero memory source emits six messages with probabilities 0.3, 0.25, 0.15, 0.12, 0.10, 0.08.

Find 4-ary (Quaternary) Huffman code. Determine its average word length, the efficiency and the redundancy.

Q4. What is hamming distance? Using hamming bound condition explain hamming code.

A parity code has the parity check matrix

$$H = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

(a) Determine the generator matrix G

(b) Find the code word that begins with 101.....

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(c) Suppose that the received code word is 110110. Decode this received word.

Q5. List the advanatges of cyclic codes over hamming codes.Construct the systematic (7,4) cyclic code using the generator polynomial $g(x) = x^3+x+1$. What are the error correcting capabilities of this code? Construct the decoding table. If the received word is 1101100, determine the transmitted data word.