Code No: 09A60404 R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B. Tech III Year II Semester Examinations, MAY/JUNE, 2013
DIGITAL COMMUNICATIONS
(ELECTRONICS AND COMMUNICATION ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) With a neat diagram explain digital communication system.
b) State and prove the sampling theorem in time domain. [15]

2.a) What are the advantages of using PCM over other types of pulse modulations?
b) Explain a delta modulator encoder.
c) A PCM system is to have a signal-to-noise ratio of 35 dB. For the speech signal, an rms to peak ratio of -10 dB is allowed. Find the number of bits required for coding. [15]

3.a) What is differential encoding and why is it required?
b) Derive expression for a spectrum of BFSK signal and draw it.
c) What is the function of digital modulation? Explain. [15]

4.a) What is pulse shaping? And explain its importance.
b) Explain eye diagrams. [15]

5.a) Explain why information measure is logarithmic and inversely proportional to the probability. What are the units of information measure?
b) What is the goal of a source encoder? If a source generates messages that are all equiprobable, would coding improve the entropy? Explain.
c) A message source generates eight symbols with the following probabilities:

$P(x_1) = \frac{1}{2}$, $P(x_2) = \frac{1}{4}$, $P(x_3) = \frac{1}{8}$, $P(x_4) = \frac{1}{16}$, $P(x_5) = \frac{1}{32}$, $P(x_6) = \frac{1}{64}$,

$P(x_7) = P(x_8) = \frac{1}{128}$.

Encode the messages x_i with variable length binary codes using Shannon Fano procedure. Find the average code length. [15]

6.a) What are linear codes? Describe the various methods of error control with their advantages and disadvantages.
b) A generator matrix for generating linear codes is as follows:

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

i) What is the message length for which this code generated may be used, the code word length, code rate, and the redundancy rate?
ii) Find the code words for the possible messages. [15]

7.a) Explain the Viterbi decoding of convolutional code.

b) A convolution encoder is described by the polynomials

$$g_1(X) = 1+X+X^2$$
$$g_2(X) = X+X^2$$

For this encoder,

i) Find the connection vectors

ii) Draw the state diagram

iii) Find the output for a message input 1010. [15]

8. Write short notes on:

a) Direct Sequence Spread Spectrum

b) Synchronization in Spread Spectrum Systems. [15]

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