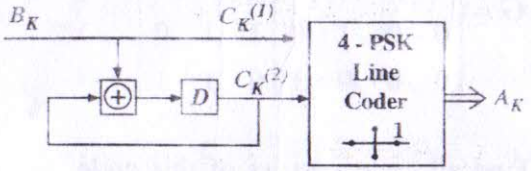
(b) Write down the steps taken in docoding the convolution code. Discuss the time domain approach of representation. If the impulse response of the input-top adder output path of the convolutional encoder is $(1, 1, 1)$ and the input bottom adder output path of the encoder is $(1, 0, 1)$. Determine the coded sequence for the message sequence (11010).

(c) What is the importance of code tree ?



Consider Fig. 1. The mapping is given by

$C_K^{(1)}$	$C_K^{(2)}$	A_K
0	0	+1
0	1	$+J$
1	0	-1
1	1	$-J$

(i) Draw the state transition diagram and trellis with each arc labelled with the pan (B_k, A_k)

(ii) Find the minimum distance error events and their distance and estimate their probability occuring. Assume the channel adds with white Gaussian noise of variance σ^2

(19)

Printed Pages : 4 TOE-17

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

PAPER ID : 0917 Roll No.

B. Tech.

(SEM. VII) EXAMINATION, 2008-09

FUNDAMENTAL OF CODING THEORY

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

Note : *(1) Attempt all questions.*
(2) All questions carry equal marks.
(3) Be precise in your answer.
(4) No second answer book will be provided.

1 Attempt any four parts of the following : 5×4=20

(a) What is the purpose of coding ? Explain the fundamentals of separable binary codes.

(b) An information source, without memory has six characters with the following probabilities $[P]$:

$[m] = [m_1, m_2, m_3, m_4, m_5, m_6]$

$[P] = \left[\frac{1}{3}, \frac{1}{4}, \frac{1}{6}, \frac{1}{5}, \frac{57}{60}\right]$. Find the code word of each charater using Huffman coding.

(c) Define ensemble of messages. Evaluate the code word of each message using Shannon-Fano coding :

$[X] = [x_1, x_2, x_3, x_4]$

$[P] = [0.1, 0.3, 0.2, 0.4]$

(d) What is discrete coding ? How are codes modified in the presence of noise ?

(e) Explain pulse digital modulation. Discuss the relevance of sampling quantization, and encoding.

(f) With appropriate example, explain shannon binary encoding.

2 Attempt any **four** parts of the following : 5×4=20

(a) What do you understand by error correcting and error detecting capability of any code ? – Explain.

(b) What is Line coder ? – Explain.

(c) Explain the relevance and importance of soft decoding.

(d) Show that the coding gain $\gamma_{\wedge}$ is invariant to the scaling of lattice $\wedge$. Specifically suppose $\wedge$ is scaled by a constant α, and call the new scaled lattice $\alpha \cdot \wedge$ show that $\gamma_{\alpha \cdot \wedge} = \gamma_{\wedge}$.

(e) With appropriate example explain the working of Hamming single error correcting codes.

(f) Explain iteration technique for coding.

3 Attempt any **two** of the following : 10×2=20

(a) With block diagram discuss process of form block codes. What is parity symbols ? Explain word error rate, false, Alarm rate and probability Bit error.

(b) Discuss all the design factors of encoders and decoders for block codes.

(c) What is syndrome ? How is it important ? Discuss syndrome decoding.

4 Attempt any **two** of the following : 10×2=20

(a) Explain cyclic redundancy check codes and maximum length codes and compare them with appropriate example.

(b) Consider a $(7, 4)$ linear code whose generator matrix is

$$G = \left[\begin{array}{cccc|ccc} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{array}\right]$$

(i) Find all code vectors of this code.

(ii) Also find the parity check matrix.

(c) Draw the block diagrams of an encoder and syndrome calculator for the given (15, 5) linear cyclic code with the following generator polynomial

$$g(x) = 1 + x + x^3 + x^4 + x^5 + x^8 + x^{10}$$

Also find the code polynomial for the message polynomial $D(x) = 1 + x^4 + x^4$.

5 Attempt any **two** of the following : 10×2=20

(a) What are convolution codes ? And why they are called practical and powerful codes ? Discuss its circuit Implementation and generation.