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328655(28)

B. E. (Sixth Semester) Examination, April-May 2020

(New Scheme)

(ET & T Engg. Branch)

INFORMATION THEORY & CODING

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) of each question is compulsory and carries 2 marks. Attempt any two parts from b, c and d of each question and carries 7 marks.*

Unit-I

1. (a) Calculate extended entropy $H(X^2)$ of source symbol whose probabilities are 0·25, 0·25, 0·34 and 0·16.

(b) Consider a DMS with source probabilities (0·20, 0·20, 0·15, 0.15, 0·10, 0·10, 0·05, 0·05).

(i) Determine an efficient fixed length code for the source.

(ii) Determine the Huffman code for this source.

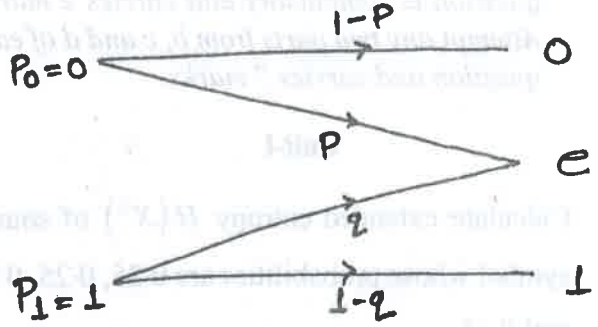
(iii) Compare the two codes and comment.

(c) Determine the Lempel-Ziv code for the following bit stream :

0100111110010100000101010110011000 0

Recover the original sequence from the extended stream.

(d) Find the capacity of the binary erasure channel shown in figure, where p_0 and p_1 are the priori probabilities.



Unit-II

2. (a) What are the objectives of a good error control coding.

(b) Construct the addition and multiplication table for :

(i) $F(x)/(x^2+x+1)$ defined over GF (2) ;

(ii) $F(x)/(x^2+1)$ defined over GF (2) ;

(c) Design the encoder for the (7, 3) cyclic code generated by $G(P) = P^3 + P + 1$ and verify its operation for any message vector.

(d) The impulse response of the input top adder output path and input bottom adder output path of convolution encoder is {1, 1, 1} and {1, 0, 1} respectively and message sequence is {1, 0, 0, 1, 1}. Calculate the convolution encoder sequence.

Unit-III

3. (a) What are the elements of GF(2)? Show the addition and multiplication of elements of GF(2) in a table.

(b) Explain encoding, decoding and also application of RS codes.

(c) Construct GF(16) as an extension field of GF(4) using primitive polynomial $P(x) = x^2 + x + 2$ over $GF(4)$.

(d) Find the generator polynomial $g(x)$ for a single error correcting binary BCH code with a block length $n = 15$. What is code rate for this code.

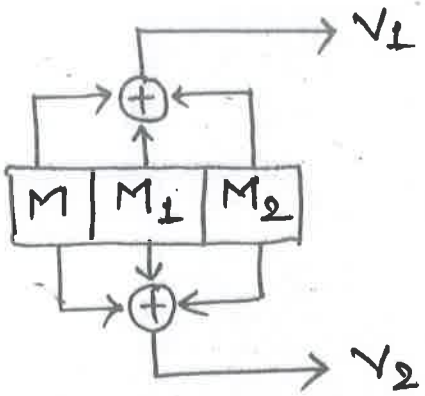
Unit-IV

4. (a) How convolutional codes are different from block code?

(b) Construct a systematic (7, 4) cyclic code using the generator polynomial $g(x) = x^3 + x^2 + 1$ what are the error correcting capabilties of this code? For the received word 1101101, determine the transmitted code word.

(c) Discuss Trellis code with example.

(d) Obtain the convolution code for the bit stream 11011011 by constructing code free.



Unit-V

5. (a) Define free Euclidean Distance of the TCM scheme.

(b) Explain in details Underboek's TCM Design Rules, also explain TCM decoder.

(c) Explain the process of Mapping by set partitioning. Why it is done.

(d) Describe the set partitioning of 8-PSK signal set along with its need.