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**B.Tech. V- Semester (Main) Examination, November - 2019**  
**ESC Computer Sc. and Engineering**  
**5CS3-01 Information Theory And Coding**

**Time : 2 Hours**

**Maximum Marks : 80**  
**Min. Passing Marks : 28**

**Instructions to Candidates:**

*Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

**PART - A**

All questions are compulsory (5×2=10)

1. Define viterbi decoding.
2. What is Galoi's Field.
3. Calculate the amount of information if  $pK = 1/4$ .
4. Define code efficiency.
5. Write the principle of static Huffman coding.

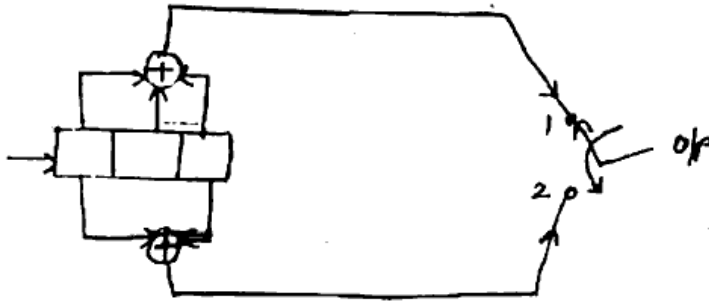
**PART - B**

Attempt any four questions (4×10=40)

1. Define an entropy and show that  $H(s)_{\max} = \log_2^9$  hits/messages symbols.
2. Consider a source  $s = [S_1, S_2]$  with probabilities  $3/4$  and  $1/4$  respectively. Obtain shannon Fono code for sources. Its 2nd and 3rd entermious. Calculate efficiency for each case.
3. Design a single error correcting code with a message block of size 11 and show that by an example that it can correct single error.
4. Consider the polynomial.

$$g(x) = x^6 + 3x^5 + x^4 + x^3 + 2x^2 + 2x + 1$$

- a) Find the parity check matrix H
  - b) Find code rate of this code
  - c) Find minimum distance of this code.
5. Design an encoder for (7,4) B<sub>cc</sub> generator by  $g(x) = 1 + x + x^3$  and verify its operation using message vector 0101.
6. Initially consider that the register contains all zeros. What will be the code sequence if the i/p data sequence is 100110.



**PART - C**

Attempt any two questions

(2×15=30)

1. Let  $x$  be number of tosses required to a coin until the first tail appears.
- a) Find entropy  $H_p(x)$  if coin is fair.
  - b) Find entropy  $H_u(x)$  if coin is unfair.  
with  $P$  being probability of getting a tail.

2. Determine the Huffman code for the following message with their.

$x_1$	$x_2$	$x_3$	$x_4$	$x_5$	$x_6$	$x_7$
0.05	0.15	0.2	0.05	0.15	0.3	0.1

and also find the average code word length, entropy, code efficiency, compare the result with entropy.

3. Consider  $G(7,4)$  block code generated by

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

Find out the error vector and suppose that the received vector  $R$  is 1001001.