**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**
**(MID SEMESTER EXAMINATION)**

**CLASS: BE** **SEMESTER: VII**
**BRANCH: ECE** **SESSION : MO/2019**

**SUBJECT : MEC1125 INFORMATION THEORY & CODING**

**TIME: 2.00 HOURS** **FULL MARKS: 25**

**INSTRUCTIONS:**
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

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Q1 (a) Define entropy and also describe its properties. [2]
(b) Show that entropy is bounded as $0 \leq H(X) \leq \log_2 K$, when K is the no. of symbols. [3]

Q2 (a) Explain relative entropy. [2]
(b) Prove the give equation for two discrete random variables X and Y, [3]
$I(X; Y) = H(X) - H(X|Y)$.

Q3 (a) Define Kraft- Mc Millan in-equality. Determine that the codes C1={00, 01, 10, 11} and C2={0,100, 110, 111} satisfy Kraft inequality or not. [2]
(b) Consider a DMS with probabilities 0.37, 0.33, 0.16, 0.07, 0.04, 0.02 and 0.01, respectively. Construct Huffman coding for the DMS and find out code efficiency. [3]

Q4 (a) Explain the prefix coding with suitable example. [2]
(b) Consider Lempel Ziv encoding for quaternary data (symbols: 0, 1, 2, 3). Encode the following quaternary data: 1 3 3 0 0 2 0 2 1 1 1 3 0 0 0 0 2 2 1 2 2 2 3 3. [3]

Q5 (a) Describe the properties of a binary symmetric channel and a binary erasure channel. [2]
(b) Evaluate the overall channel capacity of two cascaded connected BSC channels assuming that both have the same transition probability diagram with p=0.3 [3]

Q6 (a) Illustrate Shannon's channel coding theorem. [2]
(b) Explain information capacity theorem and discuss Shannon' limit. [3]

**:::: 23/09/2019M ::::::**