BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2023)

CLASS: **BTECH** **SEMESTER: VI**
BRANCH: **ECE** **SESSION: SP/2023**

SUBJECT: EC359N INFORMATION THEORY AND CODING

TIME: **02 Hours** **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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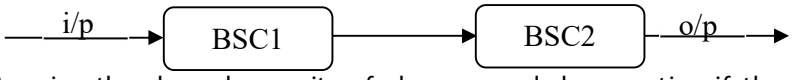
		Marks	CO	BL
Q.1(a)	Consider a DMS with source probabilities {0.30, 0.25, 0.20, 0.15, and 0.1. Determine its source entropy, H(X). Also, define entropy is a concave function.	[2]	CO1	I (R)
Q.1(b)	Show that entropy is bounded as $0 \leq H(X) \leq \log_2 K$, when K is the no. of symbols.	[3]	CO1	II (U)
Q.2(a)	Identify, which of the following codes, C1={00, 01, 10, 11} and C2={0,100, 110, 111} satisfy Kraft inequality?	[2]	CO1	III (A)
Q.2(b)	If X and Y are two discrete random variables with joint probability mass function P(x, y) and P(x) & P(y) their marginal probability mass functions, then prove that H(X,Y)=H(X) + H(Y|X)	[3]	CO1	IV (A)
Q.3(a)	Demonstrate the instantaneous code with a suitable example.	[2]	CO1	II (U)
Q.3(b)	Design Shannon-Fano-Elias code on above source distribution given in Q.1(a). Also determine its average code word length.	[3]	CO1	VI(C)
Q.4(a)	Outline the properties of binary erasure channel.	[2]	CO2	II (U)
Q.4(b)	Illustrate the information capacity theorem.	[3]	CO2	II (U)
Q.5(a)	Write the expression for channel capacity corresponding to Shannon limit.	[2]	CO2	II (U)
Q.5(b)	Two binary symmetric channels are connected in cascade.	[3]	CO2	V (E)



Determine the channel capacity of above cascaded connection if the transition probability of each BSC channel is *p*.

::::::24/02/2023::::::M