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PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations - MARCH 2026

Date: 10 - 03- 2026

Time: 02:00pm - 03:30pm

School: SOIS	Program: information Science and engineering		
Course Code: ISE2503	Course Name: Information Theory and Coding		
Semester: VI	Max Marks: 50	Weightage: 25%	

CO - Levels	C01	C02	C03	C04	C05
Marks	19	31			

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.

5Q x 2M=10M

1	Define Entropy and write its formula.	2 Marks	L understand	C01
2	State any two advantages of Arithmetic Coding over Huffman coding.	2 Marks	L understand	C02
3	Explain average mutual information	2 Marks	L understand	C01
4	Consider a source $S = \{S_1, S_2, S_3\}$ with $P = \{1/2, 1/4, 1/4\}$. Find self-information of each message.	2 Marks	L Apply	C02
5	Define Extended Huffman Coding.	2 Marks	L understand	C02

Part B

Answer the Questions.

Total Marks 40M

6.	a.	<p>A source emits symbols $\{S_1, S_2, S_3\}$ with probabilities $\{0.10, 0.5, 0.3\}$.</p> <p>Calculate the entropy of the source.</p> <p>Determine the maximum possible entropy and compare.</p>	10 Marks	L Apply	CO1
Or					
7.	a.	<p>Construct a binary Huffman code for the symbols $\{A, B, C, D, E\}$ with probabilities $\{0.40, 0.35, 0.30, 0.20, 0.010\}$.</p> <p>Find average code length and efficiency.</p>	10 Marks	L Apply	CO2

8.	a.	<p>Describe the Extended Huffman Coding algorithm.</p> <p>(b) Construct an extended Huffman code for a source with symbol probabilities $\{0.4, 0.3, 0.2, 0.1\}$ considering pairs of symbols</p>	10 Marks	L Apply, Understand	CO2
Or					
9.	a.	<p>a) Define entropy and joint entropy</p> <p>(b) A source emits symbols $\{A, B, C, D\}$ with probabilities $\{0.5, 0.25, 0.125, 0.125\}$.</p> <p>Calculate the entropy of the source.</p>	10 Marks	L Apply, Understand	CO1

10.	a.	<p>For the JPM given below, compute individually $H(X)$, $H(Y)$, $H(X, Y)$, $H(X/Y)$, $H(Y/X)$ and $I(X, Y)$. Verify the relationship among these entropies.</p> $P(X, Y) = \begin{bmatrix} 0.5 & 0 & 0.20 & 0.5 \\ 0 & 0.10 & 0.10 & 0 \\ 0 & 0 & 0.20 & 0.10 \\ 0.5 & 0.5 & 0 & 0.10 \end{bmatrix}$	10 Marks	L Apply	CO1
Or					
11.	a.	<p>A discrete memoryless source produces four symbols with probabilities $\{0.4, 0.3, 0.2, 0.1\}$.</p>	10 Marks	L Apply	CO2

		Construct Shannon–Fano code. Calculate average code length and efficiency.			
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12.	a.	Construct an extended Huffman code for a source with symbol probabilities {0.4, 0.3, 0.2, 0.1} considering pairs of symbols	10 Marks	L Apply	CO2
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Or

13.	a.	Explain the compression techniques used in the following standards: <ul style="list-style-type: none"> • JPEG • PNG • ZIP • Highlight the role of entropy coding in each. 	10 Marks	L Understand	CO2
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