

Supplementary Exam (Feb/Mar 2024)

(B. Tech) Program: (Artificial Intelligence and Data Science) AI-DS

Examination: TY Semester: V

Course Code: **AIC504** and Course Name: **Information Theory and Coding**

Duration: 2.5 Hours

Date: 05-03-2024

Max. Marks: 60

Instructions:

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

Q 1	Solve any six questions out of eight:	Max. Marks	CO	BT level
		12		
i)	Justify statement "More information being dealt more it cost"	02	CO1	Evaluating
ii)	Compare Huffman code and Arithmetic code.	02	CO2	Understanding
iii)	Write short note on Static Dictionary	02	CO3	Understanding
iv)	Explain applications of LZ77	02	CO3	Understanding
v)	What are different steps involved in JPEG Compression process?	02	CO4	Understanding
vi)	Explain in details A law compression and μ law companding.	02	CO5	Understanding
vii)	Explain following terms related to error control coding a)Code vectors and sketch code vector for 3 bit code, b)Hamming Distance, c)Hamming weight of a code word, d) Minimum distance d_{min}	02	CO6	Understanding
viii)	Write short note on Digital Audio	02	CO5	Understanding
Q.2	Solve any four questions out of six.	16		
i)	Explain Shannon's second theorem on channel capacity and Shannon's Hartley information capacity Theorem	04	CO1	Understanding
ii)	Given messages $m_1, m_2, m_3, m_4, m_5, m_6$ and m_7 and their corresponding probabilities as 0.25, 0.15, 0.10, 0.15, 0.20, 0.10 and 0.05. Construct Shannon Fano code.	04	CO2	Applying
iii)	Explain with example how RLE used for image compression.	04	CO3	Understanding
iv)	Explain different video compression methods.	04	CO4	Understanding
v)	Explain Frequency masking and Temporal masking in details	04	CO5	Understanding
vi)	Consider a (7,4) Hamming code, given matrix $H = \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{pmatrix}$ Find the generator matrix G. Find code word for $M=[1100]$ and sketch linear block encoder.	04	CO6	Applying
Q.3	Solve any two questions out of three.	16		
i)	Consider the binary channel for which the input range and output range are in both cases equal to [0,1]. The corresponding transition probabilities matrix is in the case equal to $P_{ch} = \begin{bmatrix} 3/4 & 1/4 \\ 1/8 & 7/8 \end{bmatrix}$ $P(x=0)=4/5$ and $P(x=1)=1/5$. Calculate $P(y=0)$ and $P(y=1)$, $P(x=0/y=0)$, $P(x=0/y=1)$ and $P(x=1/y=1)$	08	CO1	Applying

ii)	With $A=\{a,b,c,d\}$ and $P=\{0.35,0.25,0.3,0.1\}$. Encode the message "dcbad" using arithmetic coding and also decipher the real value tag generated.	08	CO2	Applying
iii)	Let $A=(a,b,c,d,m,n,o,p)$, encode input stream 'abcdcbamnoppnm' using move to front coding and calculate average of encoded stream. Then apply without move to front coding and calculate average of encoded stream. Comment on average calculated using above methods.	08	CO3	Applying
Q.4 Solve any two questions out of three.		16		
i)	Explain JPEG 2000 concept. What are different features of JPEG 2000	08	CO4	Understanding
ii)	Explain ADPCM encoder and decoder in detail	08	CO5	Understanding
iii)	For the convolution encoder determine, dimension of the code, code rate, Constraint length, Generating sequences (Impulse responses) output sequence for the message sequence of $m=\{1\ 0\ 0\ 1\ 1\}$	08	CO6	Applying


