(handwritten top-right: AIDS, Sc II B)

Nov – Dec 2024	
B. Tech Program: Artificial Intelligence and Data Science Scheme IIB/ II	
Regular Examination: TY Semester: V	
Course Code: AIC504 and Course Name: **Information Theory and Coding**	
Date of Exam: 25|11|2024 Duration: 02.30 Hours Max. Marks: 60	

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

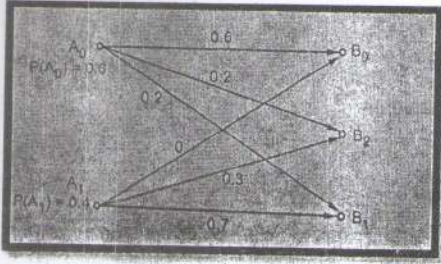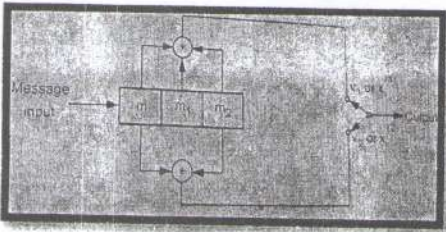| Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	How to measure information of a source mathematically? Plot relationship between Information and probability. Explain with example How probability of occurrence of event relates to the degree of uncertainty and information contents?		CO1	U
b)	A DMS with 7 symbols {x1 to x7} and the corresponding probabilities (P1 to P7} are 0.46, 0.26, 0.12, 0.06, 0.03, 0.05 and 0.02. Find Shannon Fano code.		CO2	AP
c)	Compare Static and Dynamic dictionary		CO3	U
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Explain process of JPEG data compression		CO4	U
b)	Write short note on Human Auditory System		CO5	U
c)	Obtain the generator matrix corresponding to $G(p) = p^3+p^2+1$ for a (7,4) cyclic code.		CO6	Ap
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	For the system shown A0 would generate B0 and A1 would generate B1 with certainty if there were no noise and B2 would never occur. For the situation shown. Find the optimum receiver and calculate the probability of error.		CO1	Ap

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			CO	AP/U
b)	Consider a binary source output letters from the alphabet A={a1,a2,a3} with the probability P={0.8,0.02,0.18} respectively. a) Design a Huffman code for the source. Calculate entropy, average codeword length and redundancy of code. Calculate in percentage the more number of bits required than the minimum required. b) Design a Huffman code (Extended) for the source by blocking two symbols together. Calculate average code word length, redundancy and comment on more number of bits required in a part a and part b.		CO2	AP
c)	Design a syndrome calculator for a (7,4) cyclic hamming code generated by the polynomial $G(p)= p^3+p+1$. Calculate the syndrome for Y=(1001101)		CO6	AP
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Explain MPEG video compression standard		CO4	U
b)	For the convolution encoder determine, dimension of the code, code rate, Constraint length, Generating sequences (Impulse responses) output sequence using transform domain approach for the message sequence of m={1 0 0 1 1}. 		CO6	AP
c)	Let S={A,B,C,#} and P={0.4,0.3,0.1,0.2}. We encode ABBC# using arithmetic coding generate the tag for encoding		CO2	Ap

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