

Subject Code: XXXXX

Roll No:

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**BTECH
(SEM-7) INFORMATION THEORY AND CODING 2021-22**

TIME:3 HOUR

Total Marks: 100

Instruction: Attempt the questions as per the given instructions. Assume missing data suitably.

SECTION - A

Attempt *All Parts* in Brief

2*10 = 20

Q1	Questions	Marks
(a)	Discuss the reason for using logarithmic measure for measuring the amount of information.	2
(b)	Describe the concept information rate and redundancy as referred to information transmission.	2
(c)	Write the expression for maximum entropy.	2
(d)	Evaluate the entropy for equal probable events.	2
(e)	Define memory order of convolution code ?	2
(f)	Calculate channel capacity of error free channel.	2
(g)	What are the various ways of representing convolutional codes ?	2
(h)	State competitive optimality ?	2
(i)	What is expected length $L(C)$ of a source code C^* ?	2
(j)	Draw diagram of binary erasure channel.	2

SECTION - B

Attempt Any Three of the following

3*10 = 30

Q2	Questions	Marks
(a)	Calculate mutual information and capacity of binary symmetric channel.	10
(b)	State and prove AEP.	10
(c)	Explain Jensen's Inequality and its consequences.	10
(d)	Describe hamming codes and determine hamming bound.	10
(e)	Explain Golay codes ?	10

SECTION - C

Attempt Any One of the following

5*10 = 50

Q3	Questions	Marks
(a)	State and prove Fano's inequality.	10
(b)	State and prove chain rule of entropy and relative entropy.	10
Q4	Questions	Marks
(a)	Determine the bound on optimal code length.	10
(b)	Explain Shannon Fano Elias coding.	10
Q5	Questions	Marks
(a)	Explain channel coding theorem.	10
(b)	Briefly explain the properties of jointly typical sequences.	10
Q6	Questions	Marks
(a)	Explain soft-decision decoding with example.	10
(b)	Generate (7,4) block code.	10
Q7	Questions	Marks
(a)	Using 3 stage shift register and 2 stage Modulo-2 adder with impulse response of paths (111) and (101), draw trellis diagram and if the transmitted code is 00000000 and received code have error on 2 nd and 6 th bit due to channel noise, then detect and correct the errors by using Viterbi decoding of the convolution code.	10

(b)

For the given generator polynomial $g(x) = 1 + x + x^3$ find the generator matrix G for a symmetric $(7, 4)$ cyclic code and find the systematic cyclic code for message bits 1010...

10