Assignment2(AI1103)

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1 Problem statement-GATE EC 2008(Q.67)

Consider a Binary Symmetric Channel (BSC) with probability of error being p.To transit a bit, say 1,we transmit a sequence of three 1s.The receiver will interpret the received sequence to represent 1 if at least if at least two bits are 1.The probability that the transmitted bit will be received in error is

(A)$p^3 + 3p^2(1-p)$
(B)p^3
(C)$(1-p)^3$
(D)$p^3 + p^2(1-p)$

2 Solution

First of all,let the probability that transmitted bit will be received in error be X.
We are given that probability of error = p.
So,probability of getting no error =1-p

Also,it is given that to transmit a bit we need to send a sequence of three and receiver will interpret received sequence to represent 1 if at least two bits are 1. Means we will get correct signal if we receive two correct bits among three.

So, now probability that transmitted bit,received in error=all bits are with error + one bit is with error

$$X = p \times p \times p + \binom{3}{1} \times p \times p \times (1-p) \quad (2.0.1)$$

$$X = p^3 + 3 \times p^2 \times (1-p) \quad (2.0.2)$$

$$\boxed{X = p^3 + 3p^2(1-p)} \quad (2.0.3)$$

$$So, option(A) is correct. \quad (2.0.4)$$