

Assignment2(AI1103)

SABNE KETAN SANTOSH - CS20BTECH11043

1 PROBLEM STATEMENT-GATE EC 2008(Q.67)

Consider a Binary Symmetric Channel (BSC) with probability of error being p . To transmit a bit, say 1, we transmit a sequence of three 1s. The receiver will interpret the received sequence to represent 1 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 for getting error at least two bits must have error.

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

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

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

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