∴ $\qquad$ C = 81.7 bits/sec.

(ii) Binary Symmetric Channel (BSC) :

BSC is one of the most commonly and widely used channels, whose channel diagram is shown in figure 4.7.

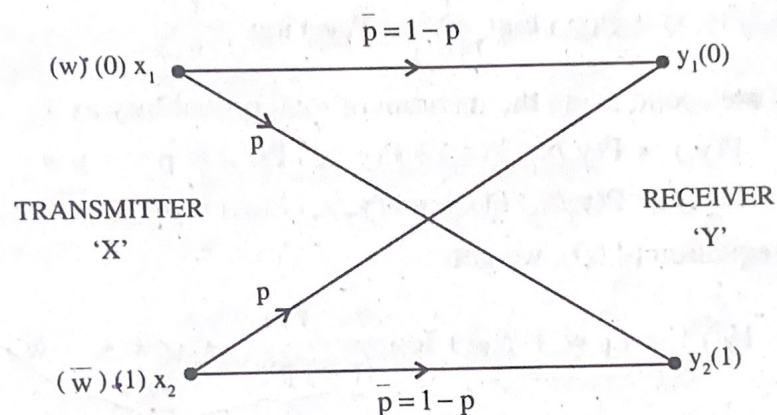

Fig. 4.7 : Channel diagram of a BSC

Let $P(x_1) = w$ and $P(x_2) = 1 - w = \overline{w}$ (say)
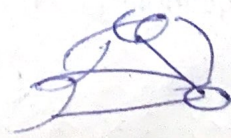
$\qquad$ Let p = probability of error

$\qquad$ = probability of reception of '1' when '0' is transmitted

$\qquad$ = probability of reception of '0' when '1' is transmitted.

Note that in a BSC, the symbol x_1 is encoded as '0' and x_2 as '1'.

The channel matrix of a BSC can be written looking at the channel diagram of figure 4.7

as

$$P(Y/X) = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{cc} y_1 & y_2 \\ \left[\begin{array}{cc} P(y_1/x_1) & P(y_2/x_1) \\ P(y_1/x_2) & P(y_2/x_2) \end{array} \right] \end{array}$$

$$P(Y/X) = \left[\begin{array}{cc} \bar{p} & p \\ p & \bar{p} \end{array} \right]$$

The matrix of equation (4.67) is a symmetric matrix and h