For possible 3-bits error.

Say, X_1, X_2, X_3.

$$\begin{array}{r} 1101101 \\ 1011011 \\ + 1000000 \\ \hline 1110110 \end{array}$$

1110110 is the error and so.on...

??? ! ! !

~~(from 1 bit to 9 bit)~~

~~(*). We can take 9 pos. possible 9-bits error, since N=9.~~ different

→ We can take 9 different ~~sy~~ sindromes are possible.

(c) Given, $N=48$, $k=24$, $d=12$.

→ # of possible codewords $= 2^{24}$ codewords.

Probability of error.

Hard decision using precise approximation is:-

$$P(E) = \sum_{h=t+1}^{N} \binom{N}{h} \varepsilon^h (1-\varepsilon)^{N-h}.$$

$R = K/N = 24/48 = 1/2$

$t = \left\lfloor \frac{d-1}{2} \right\rfloor = \left\lfloor \frac{12-1}{2} \right\rfloor = 5$

$t+1 = 6$.

$$= \sum_{6}^{48} \binom{N}{h} \varepsilon^h (1-\varepsilon)^{N-h}$$

where $\varepsilon = Q\left(\sqrt{\frac{2E_b}{N_0} \cdot Rd}\right)$.

~~where~~ $P(E) = Q\left(\sqrt{\frac{2E_b}{N_0} \cdot R(t+1)}\right) = Q\left(\sqrt{\frac{2E_b}{N_0} \cdot \frac{1}{2} \times 6}\right)$.

$N = 48$.

$h = t+1 = 6$.

For minimum bandwidth.

$$B_T = \frac{B_R}{2R}(1+\delta) \qquad \delta = 0.$$

$$= \frac{10\text{ Mbps}}{2 \times K/N} \times 1 = \frac{10}{2 \times \frac{24}{48}} = \frac{10}{\cancel{2}_1} \times \frac{\cancel{48}^{24}}{\cancel{24}} = 10\text{ MHZ}.$$

(2) For Linear Block code.

(a) Given, $N = 31$.

1 0 7 6 5 7

001 000 111 110 101 111

$D^{15} + D^{11} + D^{10} + D^9 + D^8 + D^7 + D^5 + D^3 + D^2 + D^1 + 1$. Is the $g(D)$. (generator polynomial.)