Tirth Patel ITC Tut 5
A2

Q1) $G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$

b) $G = \left[\begin{array}{cccc:ccc} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{array}\right]$

I 4×4 ; P 4×3

$\therefore [H] = [P^T : I]$

$[H] = \left[\begin{array}{ccc:ccc} 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 1 \end{array}\right]$

a) $[C] = [D][G]$
1×4 4×4

$= [d_1 d_2 d_3 d_4] \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$

Q22

$[(d_1 \cdot 1) \oplus$

$[d_1, d_2, d_3, d_4, (d_1 \oplus d_2 \oplus d_4), (d_1 \oplus d_2 \oplus d_5), (d_2 \oplus d_3 \oplus d_4)]$

$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$

$C_1 \quad C_2 \quad C_3 \quad C_4 \quad C_5 \quad C_6 \quad C_7$

d_1	d_2	d_3	d_4	C_1	C_2	C_3	C_4	C_5	C_6	C_7
0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1	1	0	1
0	0	1	0	0	0	1	0	1	1	1
0	0	1	1	0	0	1	1	0	1	0
0	1	0	0	0	1	0	0	0	1	1
0	1	0	1	0	1	0	1	1	1	0
0	1	1	0	0	1	1	0	1	0	0
0	1	1	1	0	1	1	1	0	0	1
1	0	0	0	1	0	0	0	1	1	0
1	0	0	1	1	0	0	1	0	1	1
1	0	1	0	1	0	1	0	0	0	1
1	0	1	1	1	0	1	1	1	0	0
1	1	0	0	1	1	0	0	1	0	1
1	1	0	1	1	1	0	1	0	0	0
1	1	1	0	1	1	1	0	0	1	0
1	1	1	1	1	1	1	1	1	1	1

(Q2) $H = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$

a) $n = 7$

$n - k = 3$

$k = 4$

$(n, k) = (7, 4)$

b) Recived code $= [0\ 0\ 0\ 1\ 1\ 0\ 1]$

$H^T = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$[S] = [r][H^T]$

$= [0\ 0\ 0\ 1\ 1\ 0\ 1] \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$[S] = [0 \ 0 \ 0]$

$\therefore [S] = [0 \ 0 \ 0]$

$\therefore$ No error in the code

a3) $C_1 = 1100011$

$C_2 = 0000000$

$C_3 = 0101100$

Hamming dist:

$C_1 = 1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1$ Dist = 4

$C_2 = 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$

$C_2 = 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$ Dist = 3

$C_3 = 0 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0$

$C_1 = 1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1$ Dist = 5

$C_3 = 0 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0$

Hamming weight:

$C_1 = 1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1$

No of Non zero elements = 4

Hamming weight = 4

$C_2 = 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$

Hamming weight = 0

$C_3 = 0\ 10\ 11\ 00$

Hamming weight $= 3$