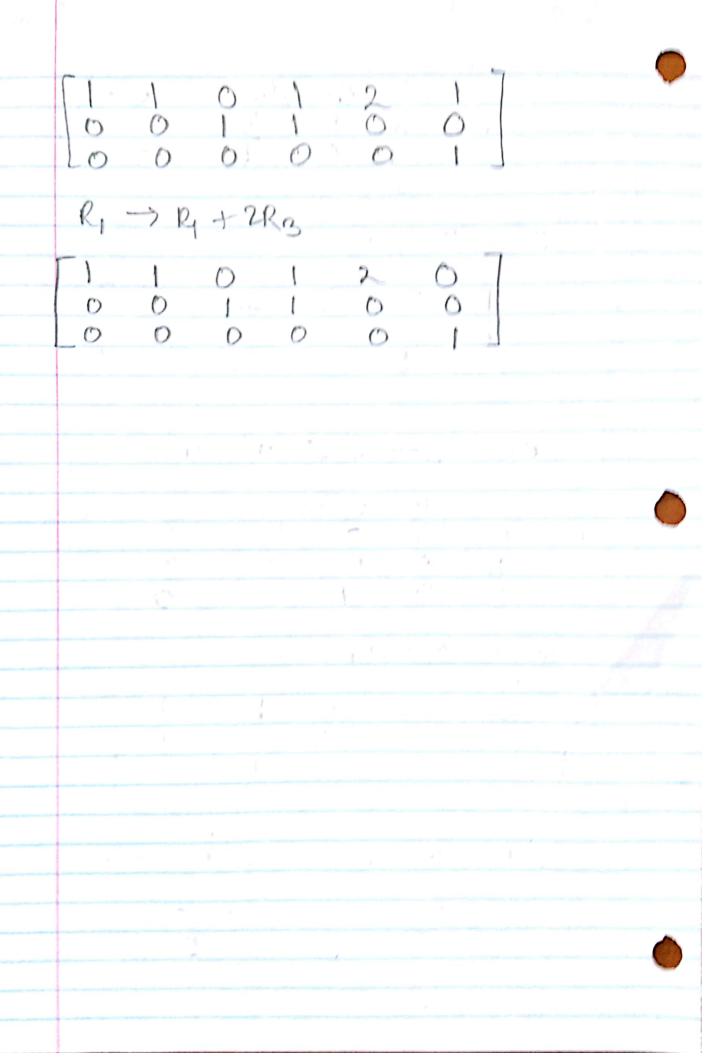
Homework - 4 Solutions.

1) 
$$\begin{bmatrix} 0 & 0 & 2 & 2 & 0 & 2 \\ 2 & 2 & 0 & 2 & 1 & 2 \\ 1 & 1 & 2 & 0 & 2 & 2 \\ 1 & 1 & 2 & 0 & 2 & 2 \\ 1 & 1 & 0 & 1 & 2 & 1 \end{bmatrix}$$
 $R_1 \rightarrow R_1 + R_3$ 
 $\begin{bmatrix} 1 & 1 & 1 & 2 & 2 & 1 \\ 2 & 2 & 0 & 2 & 1 & 2 \\ 1 & 1 & 2 & 0 & 2 & 2 \\ 1 & 1 & 0 & 1 & 2 & 1 \end{bmatrix}$ 
 $R_2 \rightarrow R_2 + R_1$ ,  $R_3 \rightarrow 2R_1 + R_3$ ,  $R_4 \rightarrow R_4 + 2R_4$ 
 $\begin{bmatrix} 1 & 1 & 1 & 2 & 2 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 2 & 2 & 0 & 0 \end{bmatrix}$ 
 $R_3 \rightarrow R_3 + R_2$ ,  $R_4 \rightarrow R_4 + R_2$ 
 $\begin{bmatrix} 1 & 1 & 1 & 2 & 2 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ 

 $R_1 \rightarrow R_1 + 2R_2$ 



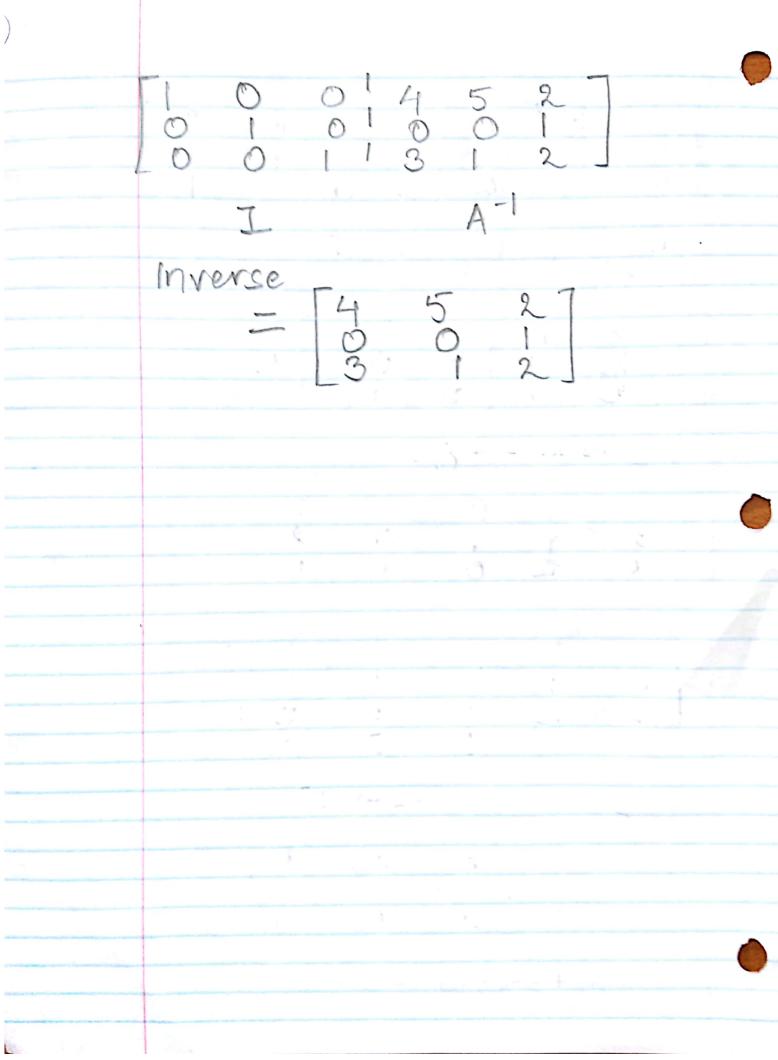
[0	0	2	2	0	2		
2	2	6	8	4	8	4.3	
1	1 5	5	6	2	5		
		3	4	2	7		
	·		,	()	( , ·		
R	> R	+ R2	2		,		

1		7	8	2	7	1
2	2	6	8	4	8	
l	1	5	G	2	5	
1		3	4	2	7	

1	1	7-	8	2	7
0	0	3	3	0	5
0	0	9	9	D	9
0	0	7	7	0	Ö

		7	8	2	7
Ò	Ö	0	0	0	5
0	O	0	D	0	1
0	0	١	.\	0	0 7

R2 -> R2+6R3 R, -> R+4R2+4R3 Using Gauss-Jordan elimination to find matrix inverse R2 -> R2+3R4  $R_2 \rightarrow R_2 + 2R_3$ Ry -> Ry +5R2+4R3 Ry (>> R3



a) Length of V, n=5 Ry -> Ry + 2R2 R2-> R2+R1 , R3-> R3+R1 R2 -> 2R2, R3-> 2R2 Ry > Ry + 2R2 + 2R3

Dimension 
$$K = 3$$

(c) Parity Check matrix H for the linear code V.

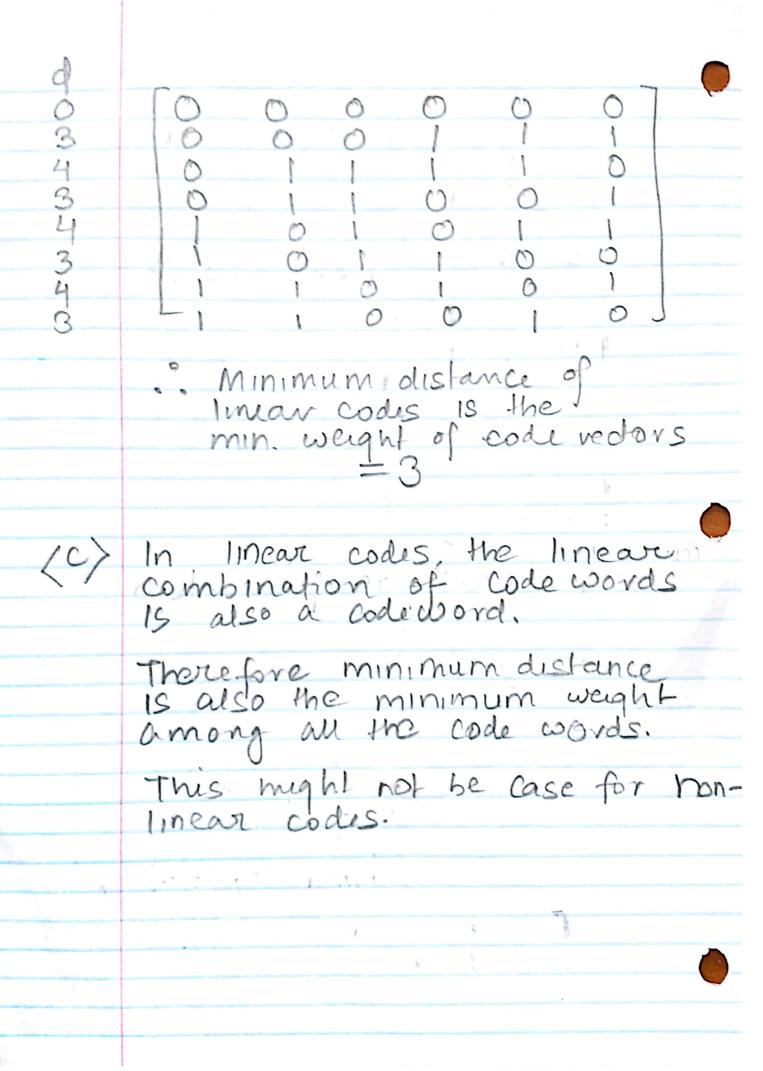
$$G = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 2 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$
Interchanging C3 and C5

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 2 & 1 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

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

$$T = \begin{bmatrix} -1 & -1 & 0 & 1 & 6 \\ -1 & -2 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$
Interchanging C3 and C6

	4-2	2	2 0	0	0	
(5) a)	$G = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$	1000	0 1			
	0000	0 7 X	9 = 0	00/[1 0 01   0 10   L0	0101	
	100	0	/10			
	rist = of code Vectors.	0000		0 0		
	vectors.			0	0 0 0	



Interchange Columns C3 and C4

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

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \\$$

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

$$R_2 \to R_2 + R_3,$$

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

$$R_3 \to R_3 + R_1$$

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

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

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