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Part I (Erron Control Codes).

1). Given, $G = \begin{bmatrix} 0&1&1&0&1&1&0&1&1 \\ 1&1&0&1&1&0&1&1&0 \end{bmatrix}$

a) $N = 9$, $K = 2$

No. of possible codewords $= 2^K = 2^2 = 4$ possible codewords.

	dmin
0 0 0 0 0 0 0 0 0	
1 1 0 1 1 0 1 1 0	6
1 0 1 1 0 1 1 0 1	6
0 1 1 0 1 1 0 1 1	6

$d_{min} = 6$

Correct G or in systematic shape.

$G = \left[\begin{array}{cc:ccccccc} 1 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 \end{array}\right]$

Thus, the generator polynomial is :- 0 1 1 0 1 1 0 1 1

$g(D) = D^7 + D^6 + D^4 + D^3 + D^1 + 1.$

To check cyclic code. $= \dfrac{D^N + 1}{g(D)}$

$$
\begin{array}{r|l}
 & D^2 + D + 1 \\
D^7+D^6+D^4+D^3+D+1 & D^9+0+0+0+0+0+0+0+0+1 \\
 & D^9+D^8+0+D^6+D^5+0+D^3+D^2 \\
\hline
 & D^8+0+D^6+D^5+0+D^3+D^2+0+1 \\
 & D^8+D^7+0+D^5+D^4+0+D^2+D+0 \\
\hline
 & D^7+D^6+0+D^4+D^3+0+D+1 \\
 & D^7+D^6+0+D^4+D^3+0+D+1 \\
\hline
 & 0
\end{array}
$$

The remainder is 0 . so,

It is cyclic code.