Solution

@Pcode: 24109

3 (a)

Soln

(a) $P = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$

$G = [I_k : P]$

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

$k = 3 \quad 2^3 = 8$ possible data words.

$C = MG$

data	Codeword
0 0 0	000000
0 0 1	001110
0 1 0	010011
0 1 1	011101
1 0 0	100111
1 0 1	101001
1 1 0	110100
1 1 1	111010

(b) $H = [P^T$

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

A discrete source emits one of five symbols once every millisecond. The symbol probabilities are $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}$ & $\frac{1}{16}$ resp. Find the source entropy & information rate.

Sol:

$$H = \sum_{i=1}^{5} P_i \log_2 (1/P_i) \text{ bits/symbol}$$

$$= 0.5 + 0.5 + 0.375 + 0.25 + 0.25$$

$$= 1.875 \text{ bits/symbol}$$

$$R = r_s H$$

$$= 1000 \times 1.875$$

Q. No-5 (c)

Find gcd (1575, 231) by Euclid's Algorithm

$1575 = 6 \times \underline{231} + 189$

$231 = 1 \times \underline{189} + 42$

$189 = 4 \times \underline{42} + 21$

$42 = 2 \times \underline{21} + 0.$

$\therefore$ G.C.d = 21

Encode the following string using LZW algorithm

bananaaan

Next Char	I/P string	Current string	Seen before	Encoded O/P	New entry in Dictionary
b	b	b	yes	-	-
a	ba	[b]a	no	1	ba=3
n	ban	[a]n	no	1,0	an=4
a	bana	[n]a	no	1,0,2	na=5
n	banan	an	yes	-	-
a	banana	[an]a	no	1,0,4	ana=6
a	bananaa	aa	no	1,0,4,0	aa=7
n	bananaan	[an]n	no	1,0,4,6	ann=8