GATE 2021-CS Q34

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Question 34:
Consider the cyclic redundancy check (CRC) based error detecting scheme having the generator polynomial $X^3 + X + 1$. Suppose the message $m_4m_3m_2m_1m_0 = 11000$ is to be transmitted. Check bits $c_2c_1c_0$ are appended at the end of the message by the transmitter using the above CRC scheme. The transmitted bit string is denoted by $m_4m_3m_2m_1m_0c_2c_1c_0$. The value of the check bit sequence $c_2c_1c_0$ is

1) 101
2) 110
3) 100
4) 111

Solution

Parameter	Description	Value
m_4	message bit	1
m_3	message bit	1
m_2	message bit	0
m_1	message bit	0
m_0	message bit	0
c_2	appended bit	
c_1	appended bit	
c_0	appended bit	

TABLE I
GIVEN PARAMETERS LIST

Message: $m_4m_3m_2m_1m_0 = 11000$
Generator polynomial: $g(x) = x^3 + x + 1 = 1101$
Append zeros: 11000000
Divide by $g(x)$ using modulo-2 division:

$$
\begin{array}{r}
1101\overline{)11000000} \\
-\underline{1101} \\
1110 \\
-\underline{1101} \\
111 \\
-\underline{1101} \\
100
\end{array}
$$

Check bits: $c_2c_1c_0 = 100$