Q.1 The message 1011010110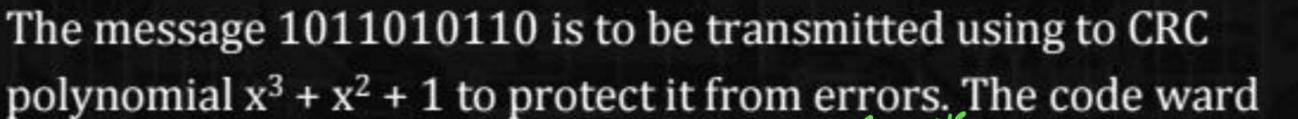 is to be transmitted using to CRC polynomial $x^3 + x^2 + 1$ to protect it from errors. The code ward that should be transmitted will be.

[MCQ]

A. ✗ 1011010110000

B. ✗ 1011010110011

C. ✗ 1011010110100

D. ✓ 1011010110111

$g(x) = x^3 + x^2 + 1$

$= 1 \times x^3 + 1 \times x^2 + 0 \times x^1 + 1 \times x^0$

$= 1101$

$\boxed{1011010110111}$

XOR:

XOR	A	B	o/p
	0	0	0
	0	1	1
	1	0	1
	1	1	0

Q.2 Which of the following is (not false) regarding cyclic redundancy check (CRC)?

[MSQ]

A. CRC is an error correction method.

B. CRC is an error detection method.

C. CRC is an error correction & detection method.

D. CRC is based on binary division.

$$n = k + r$$

Ans [B, D]

Q.3 Given generator function $G(x)$ and the message function $m(x)$ as follows.

$G(x) = x^4 + x + 1 \Rightarrow (1)x^4 + (0)x^3 + (0)x^2 + (1)x^1 + (0)x^0 \Rightarrow 10011$

$M(x) = \underline{x^9} + x^8 + x^6 + x^4 + x^3 + x + 1 \Rightarrow 1101011011$

What will be transmitted function among the following options.

[MCQ]

A. $x^{13} + x^{12} + x^{11} + x^8 + x^7 + x^6 + x^5 + x^3 + x^2 + 1$

B. $x^{13} + x^{12} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^3 + x^2 + x$

C. $x^{13} + x^{12} + x^{11} + x^8 + x^7 + x^6 + x^5 + x^3 + x^2 + x$

D. $x^{13} + x^{12} + x^{11} + x^{10} + x^7 + x^6 + x^5 + x^3 + x^2 + 1$

Ans (B)

$$\begin{array}{r} 1\,1\,0\,0\,0\,0\,1\,0\,1\,0 \\ \hline 1\,0\,0\,1\,1\,)\,\overline{1\,1\,0\,1\,0\,1\,1\,0\,1\,1\,0\,0\,0\,0} \\ 1\,0\,0\,1\,1 \\ \hline X\,1\,0\,0\,1\,1 \\ 1\,0\,0\,1\,1 \\ \hline X\,0\,0\,0\,0\,1 \\ 0\,0\,0\,0\,0 \\ \hline X\,0\,0\,0\,1\,0 \\ 0\,0\,0\,0\,0 \\ \hline X\,0\,0\,1\,0\,1 \\ 0\,0\,0\,0\,0 \\ \hline X\,0\,1\,0\,1\,1 \\ 0\,0\,0\,0\,0 \\ \hline X\,1\,0\,1\,1\,0 \\ 1\,0\,0\,1\,1 \\ \hline X\,0\,1\,0\,1\,0 \\ 0\,0\,0\,0\,0 \\ \hline X\,1\,0\,1\,0\,0 \\ 1\,0\,0\,1\,1 \\ \hline X\,0\,1\,1\,1\,0 \\ 0\,0\,0\,0\,0 \\ \hline X\,1\,1\,1\,0\, - CRC\ Remainder \end{array}$$

Codeword = $1\,1\,0\,1\,0\,1\,1\,0\,1\,1\,\,1\,1\,1\,0$

$= x^{13} + x^{12} + x^{10} + x^8 + x^7$
$+ x^5 + x^4 + x^3 + x^2 + x$

Q.4 A $d(x)$ is $x^7 + x^5 + x^4 + x^2 + 1$ transmitted using CRC polynomial method. The $g(x)$ is $x^3 + 1$. What is the polynomial of CRC remainder?

[MCQ]

$d(x) = x^7 + x^5 + x^4 + x^2 + 1 \Rightarrow \boxed{1 0 1 1 0 1 0 1}$

$g(x) = x^3 + 1 \Rightarrow \underline{1 0 0 1}$

A. $x + x^0$

B. x^0

C. $x^2 + x^0$

D. $x^2 + x + x^0$

CRC
Rem.

$= 0 0 1$
$= \boxed{x^0}$

$$
\begin{array}{r}
1 0 1 0 0 0 0 1 \\
1001\overline{)1 0 1 1 0 1 0 1 0 0 0} \\
1 0 0 1 \\
\hline
0 1 0 0 \\
0 0 0 0 \\
\hline
1 0 0 1 \\
1 0 0 1 \\
\hline
0 0 0 0 \\
0 0 0 0 \\
\hline
0 0 0 1 \\
0 0 0 0 \\
\hline
0 0 1 0 \\
0 0 0 0 \\
\hline
0 1 0 0 \\
0 0 0 0 \\
\hline
1 0 0 0 \\
1 0 0 1 \\
\hline
\boxed{0 0 1}
\end{array}
$$

Q.5 For the given bits 10101011 and generator polynomial $x^3 + 1$ calculate the CRC remainder.

$\Rightarrow 1001$

Note: If you are getting 1101 as the answer write it in the decimal. (for example $(1101)_2 = 13$).

[NAT]

$$1001) \overline{10101011000} (1011111 60$$

Range 4 to 4

$$
\begin{array}{l}
1001 \\
\overline{\times 01111} \\
0000 \\
\overline{\times 1110} \\
1001 \\
\overline{\times 1111} \\
1001 \\
\overline{\times 1101} \\
1001 \\
\overline{\times 1000} \\
1001 \\
\overline{\times 6010} \\
0006 \\
\overline{\times 6160}
\end{array}
$$

$$
\begin{array}{l}
0106 \\
0000 \\
\overline{\times 100} \Rightarrow CRC\ Rem...
\end{array}
$$

$(100)_2 \Rightarrow (4)_{10}$