3.2.5.

Apply these operations

a) $(x^3 + x^2 + x + 1) + (x^4 + x^2 + x + 1)$

$$\oplus \ \begin{array}{c} 1111 \\ 10111 \\ \hline 11000 \end{array} \rightarrow \boxed{x^4 + x^3}$$

b) $(x^3 + x^2 + x + 1) - (x^4 + x^2 + x + 1) \rightarrow \oplus \begin{array}{c} 1111 \\ 10111 \\ \hline 11000 \end{array} \rightarrow \boxed{x^4 + x^3}$

c) $(x^3 + x^2)(x^4 + x^2 + x + 1)$

$$\begin{array}{c} 10111 \\ \times \quad 1100 \\ \hline 10111 \\ \oplus \ 10111 \\ \hline 11100100 \end{array} \rightarrow \boxed{x^7 + x^6 + x^3 + x^2}$$

d) $(x^3 + x^2 + x + 1)(x^2 + 1)$

$$\begin{array}{c} 1111 \\ \times \quad 101 \\ \hline 1111 \\ \oplus \ 111100 \\ \hline 110011 \end{array} \rightarrow \boxed{x^5 + x^4 + x + 1} \quad \boxed{mod: 101} \begin{array}{c} 1111 \\ 101 \\ \hline 101 \\ 101 \\ \hline 000 \end{array} \rightarrow \boxed{0}$$

3.2.6. Answer

a) What is the polynomial representation of 101110?

$$\boxed{x^5 + x^3 + x^2 + x}$$

b) Shift 101110 three bits to the left

$$\boxed{101110000}$$

c) Repeat (b) using polynomials

$$\boxed{x^8 + x^6 + x^5 + x^4}$$

d) Shift 101110 four bits to the right

$$\boxed{10}$$

e) Repeat (d) using polynomials

$$\boxed{x}$$