

Q1

GF(11)

Z ₁₁	0	1	2	3	4	5	6	7	8	9	10
AI	0	10	9	8	7	6	5	4	3	2	1
MI	X	1	6	4	3	9	2	8	7	5	10

$$(a) (9x^5 + 4x^4 + 8x^3 + 2x^2 + 3x + 4) + (6x^5 + 2x^4 + 9x^3 + 7x^2 + 5x + 7)$$

$$\Rightarrow 15x^5 + 6x^4 + 17x^3 + 9x^2 + 8x + 11$$

$$\Rightarrow 4x^5 + 6x^4 + 6x^3 + 9x^2 + 8x$$

$$(b) (8x^3 + 6x^2 + 8x + 1) \times (3x^3 + 9x^2 + 7x + 5)$$

$$\Rightarrow \begin{array}{r} 8x^3 + 6x^2 + 8x + 1 \\ \times 3x^3 + 9x^2 + 7x + 5 \\ \hline 40x^3 + 30x^2 + 40x + 5 \end{array}$$

$$\begin{array}{r} 72x^5 + 56x^4 + 42x^3 + 56x^2 + 7x \\ 24x^6 + 18x^5 + 24x^4 + 3x^3 \\ \hline 24x^6 + 90x^5 + 134x^4 + 157x^3 + 95x^2 + 47x + 5 \end{array}$$

$$\Rightarrow 2x^6 + 2x^5 + 2x^4 + 3x^3 + 7x^2 + 3x + 5$$

$$(c) (3x^3 - 5x^2 + 10x - 3) / (3x + 1)$$

$$\begin{array}{r} x^2 + 9x + 4 \\ 3x + 1 \overline{) 3x^3 - 5x^2 + 10x - 3} \\ \underline{-) 3x^2 + x^2} \end{array}$$

$$5x^2 + 10x$$

$$\underline{-) 5x^2 + 9x}$$

$$x - 3$$

$$\underline{-) x + 4}$$

$$4$$

$$\Rightarrow x^2 + 9x + 4 + \frac{4}{3x+1}$$

$$9 \times 3 = 27$$

$$27 \bmod 11 = 5$$

$$Q_2(a) \quad (x^2+x+1) \times (x^2+x)$$

$$\Rightarrow x^2+x+1$$

$$\times \quad x^2+x$$

$$\hline x^4+x^3+x^2$$

$$x^4+x^3+x^2$$

$$\hline x^4+x$$

$$\Rightarrow (x^4+x) \bmod (x^3+x+1)$$

$$= x^2$$

$$x^3+x+1 \overline{) x^4+x}$$

$$\underline{-) x^4+x^2+x}$$

$$x^2$$

$$(b) \quad x^2 - (x^2+x+1)$$

$$= -x-1$$

$$\Rightarrow x+1$$

$$(c) \quad (x^2+x+1) / (x^2+1)$$

$$x^2+1 \overline{) x^2+x+1}$$

$$\underline{-) x^2+1}$$

$$x$$

$$\Rightarrow 1 + \frac{x}{x^2+1}$$