→ Inverse Z Transform:

1) $X(z) = \dfrac{10z}{z^2 - 3z + 2}$

$X(z) = \dfrac{10z}{(z-1)(z-2)} = 10z \left[\dfrac{1}{(z-1)(z-2)}\right]$

$\dfrac{1}{(z-1)(z-2)} = \dfrac{-1}{z-1} + \dfrac{1}{z-2}$ [∵ Partial fraction]

$X(z) = 10\left[\dfrac{-z}{z-1} + \dfrac{z}{z-2}\right]$

Applying Inverse,

$Z^{-1}[X(z)] = 10[-1 + 2^n]$

2) $X(z) = \dfrac{z}{z^2 + 7z + 10}$

$= z\left[\dfrac{1}{(z+5)(z+2)}\right]$

$= z\left[\dfrac{1/3\,(z)}{z+2} + \dfrac{(-1/3)\,z}{z+5}\right]$ [Partial fractions]

Applying Inverse,

$Z^{-1}[X(z)] = \frac{1}{3}(-2)^n - \frac{1}{3}(-5)^n$

3) $X(z) = \dfrac{8z^2}{(2z-1)(4z-1)}$

$\dfrac{X(z)}{8(z)} = \dfrac{z}{(2z-1)(4z-1)}$

$\dfrac{z}{(2z-1)(4z-1)} = \dfrac{A}{(2z-1)} + \dfrac{B}{(4z-1)}$ [Partial fractions]

$A = 1/2 \quad B = -1/2$

$\dfrac{X(z)}{8(z)} = \dfrac{1/2}{(2z-1)} - \dfrac{1/2}{(4z-1)}$

$$X(z) = \frac{4z}{2z-1} - \frac{4z}{4z-1}$$

$$= \frac{2z}{z-1/2} - \frac{z}{z-1/4}$$

Apply Inverse,

$$Z^{-1}[X(z)] = 2(1/2)^n - (1/4)^n$$

K.B

4) $$\frac{z^2+z}{(z-1)(z^2+1)} = \frac{z(z+1)}{(z-1)(z^2+1)}$$

$$\frac{X(z)}{z} = \frac{z+1}{(z-1)(z^2+1)}$$

$$\frac{z+1}{(z-1)(z^2+1)} = \frac{A}{(z-1)} + \frac{Bz+C}{(z^2+1)}$$ [By Partial Fractions]

$$A = 1 ; B = -1 ; C = 0$$

$$\frac{X(z)}{z} = \frac{1}{(z-1)} + \frac{-z}{(z^2+1)}$$

$$X(z) = \frac{z}{(z-1)} - \frac{z^2}{(z^2+1)}$$

Apply Inverse,

$$Z^{-1}[X(z)] = 1^n - \cos\left(\frac{n\pi}{2}\right)$$

K.B

5) $$X(z) = \frac{2z}{z^3 - z^2 + z - 1}$$

$$X(z) = \frac{2z}{(z-1)(z^2+1)}$$

$$\frac{X(z)}{z} = \frac{2}{(z-1)(z^2+1)}$$

$$\frac{2}{(z-1)(z^2+1)} = \frac{A}{(z-1)} + \frac{Bz+C}{(z^2+1)}$$

$A=1 \quad B=-1 \quad C=-1$

$$\frac{2}{(z-1)(z^2+1)} = \frac{1}{z-1} + \frac{-z-1}{z^2+1} = \frac{1}{z-1} - \frac{(z+1)}{z^2+1} = \frac{1}{z-1} - \frac{z}{z^2+1} \frac{-1}{z^2+1}$$

$$X(z) = \frac{z}{z-1} - \frac{z^2}{z^2+1} \frac{-z}{z^2+1}$$

Apply Inverse,

$$Z^{-1}[X(z)] = 1 - \cos\frac{n\pi}{2} - \sin\frac{n\pi}{2}.$$