



DEPARTMENT OF MATHEMATICS

UNIT-V Z-TRANSFORM

Method of partial fraction:

$$2) \text{ Find } z^{-1} \left[\frac{4z^2 - 2z}{(z-1)(z-2)^2} \right]$$

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

$$4z^2 - 2z = A(z-2)^2 + B(z-2) + C(z-1)$$

$$\text{put } z=2 \Rightarrow C=12$$

$$\text{put } z=1 \Rightarrow A=2$$

$$\text{put } z=0 \Rightarrow B=2$$

$$\frac{4z^2 - 2z}{(z-1)(z-2)^2} = \frac{2}{(z-1)} + \frac{2}{(z-2)} + \frac{12}{(z-2)^2}$$

$$z^{-1} \left[\frac{4z^2 - 2z}{(z-1)(z-2)^2} \right] = 2z^{-1} \left[\frac{1}{z-1} \right] + 2z^{-1} \left[\frac{1}{z-2} \right] + 12z^{-1} \left[\frac{1}{(z-2)^2} \right]$$

$$= 2(1)^{n-1} + 2(2)^{n-1} + 12(n-1)(2)^{n-2}$$



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3) Find $z^{-1} \left[\frac{z^2 - 3z}{(z+5)(z-2)} \right]$

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

$$\frac{F(z)}{z} = \frac{z - 3}{(z+5)(z-2)}$$

$$\frac{z-3}{(z+5)(z-2)} = \frac{A}{z+5} + \frac{B}{z-2}$$

$$z-3 = A(z-2) + B(z+5)$$

put $z=2 \Rightarrow B = -1/7$

put $z=-5 \Rightarrow A = 8/7$

$$\frac{F(z)}{z} = \frac{8/7}{z+5} - \frac{1/7}{z-2}$$

$$\Rightarrow F(z) = \frac{8}{7} \left(\frac{z}{z+5} \right) - \frac{1}{7} \left(\frac{z}{z-2} \right)$$

$$z^{-1} \left[\frac{z^2 - 3z}{(z+5)(z-2)} \right] = \frac{8}{7} z^{-1} \left[\frac{z}{z+5} \right] - \frac{1}{7} z^{-1} \left[\frac{z}{z-2} \right]$$

$$= \frac{8}{7} (-5)^{-n} - \frac{1}{7} (2)^{-n}$$