4.5 (2) (a)

GIVEN: $X(z) = \dfrac{z-1}{(z-0.707)^2}$ find $x[n]$ USING P.F.E.

$$\frac{X(z)}{z} = \frac{z-1}{z(z-0.707)^2} = \frac{D_1}{z} + \frac{D_2}{z-0.707} + \frac{D_3}{(z-0.707)^2}$$

$$D_1 = \left.\frac{X(z)}{z}\cdot z\right|_{z=0} = \frac{0-1}{(0-0.707)^2} = -2$$

$$D_2 = \left.\frac{d}{dz}\left[\frac{X(z)}{z}(z-0.707)^2\right]\right|_{z=.707} = \left.\frac{d}{dz}\left[\frac{(z-0.707)^2(z-1)}{z(z-0.707)^2}\right]\right|_{z=.707}$$

$$= \left.\frac{d}{dz}\left[\frac{z-1}{z}\right]\right|_{z=0.707} = \left.\frac{d}{dz}\left(1-z^{-1}\right)\right|_{0.707} = (0.707)^{-2} = 2$$

$$D_3 = \left.\frac{X(z)}{z}(z-0.707)^2\right|_{z=0.707} = \left.\frac{(z-1)(z-.707)^2}{z(z-.707)^2}\right|_{z=.707}$$

$$= \frac{(0.707)-1}{0.707} = -0.414$$

$$\frac{X(z)}{z} = \frac{-2}{z} + \frac{2}{(z-0.707)} - \frac{0.414}{(z-0.707)^2}$$

$$X(z) = -2 + \frac{2z}{(z-0.707)} - \frac{0.414z}{(z-0.707)^2} \rightarrow \frac{Kaz}{(z-a)^2}$$

$$K = \frac{0.414}{0.707} = 0.586$$

$$x[n] = \left[-2\delta[n] + 2(0.707)^n u[n] - 0.586(0.707)^n u[n]\right]$$