8.3.1) 5.8F

Show that

$$V = V_+ e^{-j\beta z} + V_+ |\rho| e^{j(\theta_\rho + \beta z)}$$

can be written as a standing and travelling wave

$$V = V_+ e^{-j\beta z} + V_+ |\rho| e^{j\theta_\rho} e^{j\beta z}$$

$$V = V_+ \left(e^{-j\beta z} + |\rho| e^{j\theta_\rho} e^{j\beta z} \right)$$

$$V = V_+ \left(\cos(\omega t - \beta z) + |\rho| e^{j\theta_\rho} \cos(\omega t + \beta z) \right)$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$+ \quad \cos(A-B) = \cos A \cos B + \sin A \sin B$$

$$\cos(A+B) + \cos(A-B) = 2\cos A \cos B$$

$$A = \omega t \qquad B = \beta z$$

$$V = V_+ \left(2\cos(\omega t)\cos(\beta z) - \cos(\omega t + \beta z) + |\rho| e^{j\theta_\rho} \cos(\omega t + \beta z) \right)$$

$$\boxed{V = V_+ \left(2\cos(\omega t)\cos(\beta z) + \left(|\rho| e^{j\theta_\rho} - 1 \right) \cos(\omega t + \beta z) \right)}$$

Standing — travelling