

2) Find $f(t)$ (Express complex poles in cosine format) from $F(s)$ by doing a PFE

$$F(s) = \frac{s+4}{s^2 + 4s + 40}$$

Roots $s = \frac{-4 \pm \sqrt{16 - 160}}{2} = \frac{-4 \pm j12}{2} = -2 \pm j6$

$$F(s) = \frac{s+4}{(s+2-j6)(s+2+j6)} = \frac{k_1}{s+2-j6} + \frac{k_1^*}{s+2+j6}$$

$$k_1 = (s+2-j6) \frac{s+4}{(s+2-j6)(s+2+j6)} \Big|_{s=-2+j6}$$

$$= \frac{-2+j6+4}{-2+j6+2+j6} = \frac{2+j6}{j12}$$

$$= -j \frac{2}{12} + \frac{6}{12} = 0.5 - j0.166$$

$$= 0.527 \angle -18.43^\circ$$

$$\therefore f(t) = (2)(0.527) e^{-2t} \cos(6t - 18.43^\circ)$$

$$= 1.054 e^{-t/500m} \cos(2\pi \cdot 955m \cdot t - 18.43^\circ)$$

FOR $t > 0$

$$f(t) = \underline{1.054 e^{-t/500m} \cos(2\pi \cdot 955m \cdot t - 18.43^\circ) u(t)}$$