3) a) I) $T(s) = \frac{5}{(s+3)(s+6)}$

Poles at $s=-3$ and $s=-6$: Overdamped

No zeros

$$L^{-1}[T(s)] = \frac{5}{3}e^{-3t} - \frac{5}{3}e^{-6t}$$

General:

$$Ae^{-3t} - Be^{-6t}$$

II)

$$T(s) = \frac{20}{s^2+6s+144}$$

Poles: $s = \frac{-6 \pm \sqrt{-540}}{2} = -3 \pm 11.6j$ → Underdamped

$$L^{-1}(T(s)) = \frac{\sqrt{15}\, e^{-3t} \cdot \sin(3\cdot\sqrt{5}\, t)\cdot 4}{9}$$

General:

$$Ae^{-3t} \cdot B\sin(Ct) \rightarrow Ae^{-3t} \cdot \sin(Bt)$$