We observe that the Laplace inverse of this function will be periodic, with ~~period~~ period T.

This is because of the part:

$$\frac{1}{(1-e^{-sT})}$$

If we ignore this part initially and find the function for the first period $y_1(t)$:

$$\frac{Y(s)}{A} = \frac{Y_1(s)}{(1-e^{-sT})}$$

$$Y_1(s) = \frac{\omega_n^2 - \omega_n^2 e^{-st_1}}{s(s^2+2\zeta\omega_n s+\omega_n^2)}$$

$$= \frac{\omega_n^2}{s(s^2+2\zeta\omega_n s+\omega_n^2)} - \frac{\omega_n^2 e^{-st_1}}{s(s^2+2\zeta\omega_n s+\omega_n^2)}$$

$$= ?$$

1 unit step response of 2nd order system.