System Simulation Problem #3

Tyler Matthews

A) $\frac{U_o}{U_i} = \frac{4/3 \times 10^7}{s^2 + 250s + 3.33\times10^7}$

$$\frac{U_o}{U_i} = \frac{4/3\times10^7}{\left(\frac{z-1}{Tz}\right)^2 + 250\left(\frac{z-1}{Tz}\right) + 3.33\times10^7}$$

$$\frac{U_o}{U_i} = \frac{4/3\times10^7}{\frac{z^2-2z+1}{T^2z^2} + 250\left(\frac{z-1}{Tz}\right) + 3.33\times10^7} = \frac{4/3\times10^7}{\frac{1}{T^2} - \frac{2}{T^2z} + \frac{1}{T^2z^2} + \frac{250}{T} - \frac{250}{Tz} + 3.33\times10^7}$$

$$\frac{U_o}{U_i} = \frac{4/3\times10^7}{\frac{1}{z^2}\left(\frac{1}{T^2}\right) + \frac{1}{z}\left(\frac{-2}{T^2} - \frac{250}{T}\right) + \left(\frac{1}{T^2} + \frac{250}{T} + 3.33\times10^7\right)}$$

$$U_o\left(\frac{1}{z^2}\left(\frac{1}{T^2}\right) + \frac{1}{z}\left(\frac{-2}{T^2} - \frac{250}{T}\right) + \left(\frac{1}{T^2} + \frac{250}{T} + 3.33\times10^7\right)\right) = U_i\left(4/3\times10^7\right)$$

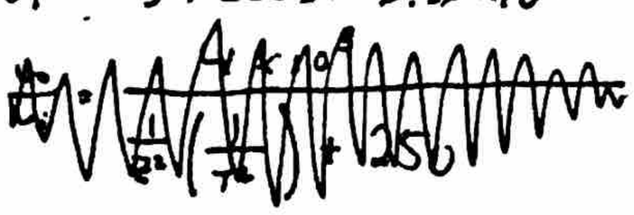
$$V_o[k-2]\left(\frac{1}{T^2}\right) + V_o[k-1]\left(\frac{-2}{T^2} - \frac{250}{T}\right) + V_o[k]\left(\frac{1}{T^2} + \frac{250}{T} + 3.33\times10^7\right) = V_i[k]\left(4/3\times10^7\right)$$

$$U_o[k] = \frac{U_i[k]\left(4/3\times10^7\right) - V_o[k-2]\left(\frac{1}{T^2}\right) - V_o[k-1]\left(\frac{-2}{T^2} - \frac{250}{T}\right)}{\left(\frac{1}{T^2} + \frac{250}{I} + 3.33\times10^7\right)}$$

w/ same analysis diff numbers

Problem #3

B) $\frac{U_o}{U_i} = \frac{4\times10^8}{s^2 + 250s + 3.33\times10^7}$ @ $0.4\,u_s(t)$



$$\frac{U_o}{U_i} = \frac{4\times10^8}{\left(\frac{z-1}{Tz}\right)^2 + 250\left(\frac{z-1}{Tz}\right) + 3.33\times10^7} = \frac{4\times10^8}{\frac{1}{z^2}\left(\frac{1}{T^2}\right) + \frac{1}{z}\left(\frac{-2}{T^2} - \frac{250}{T}\right) + \left(\frac{1}{T^2} + \frac{250}{T} + 3.33\times10^7\right)}$$

$$U_o[k] = \frac{U_i[k]\left(4\times10^8\right) - V_o[k-2]\left(\frac{1}{T^2}\right) - V_o[k-1]\left(\frac{-2}{T^2} - \frac{250}{T}\right)}{\frac{1}{T^2} + \frac{250}{T} + 3.33\times10^7}$$