PROBLEM 1

1) looks like there is a zero @ 0.1   +20

               a pole @ 1   -20

               pole @ 100   -20

                          $\overline{-20}$ ✓

initial $dB = 0$

$$10^{\frac{0}{20}} = 1$$

so $T = \dfrac{\frac{s}{0.1}+1}{\left(\frac{s}{1}+1\right)\left(\frac{s}{100}+1\right)} = \dfrac{1000s + 100}{(s+100)(s+1)}$

$$= \boxed{\dfrac{1000 \cdot \left(s+\frac{1}{10}\right)}{(s+100)(s+1)}}$$

2) $\lim\limits_{t\to\infty} e(t) = 0$

$\lim\limits_{s\to 0} sE(s) = 0$ $\lim\limits_{s\to 0} s(R-Y) = 0$ $\lim\limits_{s\to 0} sR(1-T) = 0$

$$\lim_{s\to 0}\left(1 - \frac{K \cdot 1000\left(s+\frac{1}{10}\right)}{s^2 + 101s + 100}\right) = 0$$

$$= \lim_{s\to 0}\left(1 - \frac{K \cdot 100}{100}\right) = 0 \qquad \boxed{K = 1 \;✓}$$