Perturbation Variables:

1. $\frac{dz}{dt} = 5 \cdot u \cdot z - \sqrt{d}$ $\qquad z_{ss} = \frac{\sqrt{d_{ss}}}{5 \cdot u_{ss}}$

$d_{ss} = 0 \qquad u_{ss} = 1 \qquad z_{ss} = 0$

$\frac{dz^p}{dt} = 5 \cdot \left(u^p + u_{ss}\right) \cdot \left(z^p + z_{ss}\right) - \sqrt{d^p + d_{ss}}$

$\frac{dz^p}{dt} = \left(5 \cdot u^p + 5\right) \cdot z^p - \sqrt{d^p}$

2. $\frac{d}{dt} y + 3 \cdot u \cdot y = e^{-2 \cdot t} + 2$ $\qquad y_{ss} = \frac{2}{3} \cdot \frac{1}{u_{ss}}$

$u_{ss} = 1 \qquad y_{ss} = \frac{2}{3}$

$\frac{dy^p}{dt} + 3 \cdot \left(u^p + u_{ss}\right) \cdot \left(y^p + y_{ss}\right) = e^{-2 \cdot t} + 2$

$\frac{dy^p}{dt} + 3 \cdot u^p \cdot y^p + 2 \cdot u^p + 3 \cdot y^p = e^{-2 \cdot t}$

linearizing around the steady state, or $y_p=0$ and $u_p=0$,

$\frac{dy^p}{dt} = -3 \cdot y^p - 2 \cdot u^p + e^{-2 \cdot t}$