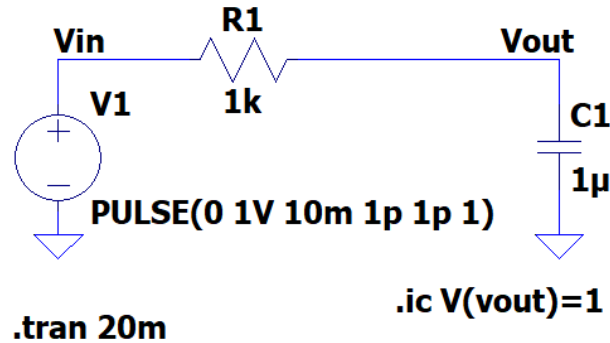Quiz #8 EE 360 Fall 2021   Name:_____

Open book and open notes

Show your work for credit and place boxes around your answers.

Consider the following RC circuit

.tran 20m

That has an input voltage signal, $V_{in}(t)$, output voltage signal, $V_{out}(t)$, and an initial voltage at the capacitor of $V_{out}(t = 0^-) = 1V$.

1. Describe the system with differential equations. You may replace $V_{in}(t) = x(t)$ and $V_{out}(t) = y(t)$ at the end. (hint, $I_C(t) = C \cdot \frac{dV_{out}(t)}{dt}$)

2. Convert the differential equation from above using the Laplace Transform (hint: use the unilateral Laplace Transform property of differentiation). Identify the zero-input and zero-state responses. Sketch the region of convergence.

3. Solve for the total response of the system when the input is $V_{in}(t) = 1V \cdot u(t - 10ms)$. (hint: solve for the ZIR and ZSR of the system from problem 2). Verify in LTSpice.