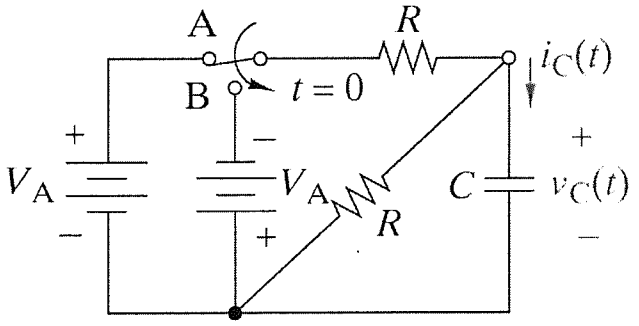
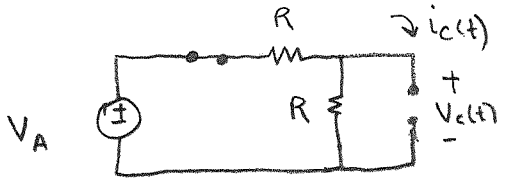
ECE332 Quiz 4
(10 minutes)

Name: Solution

1. [75 pts] **Given**: The switch below has been in position A for a long time.



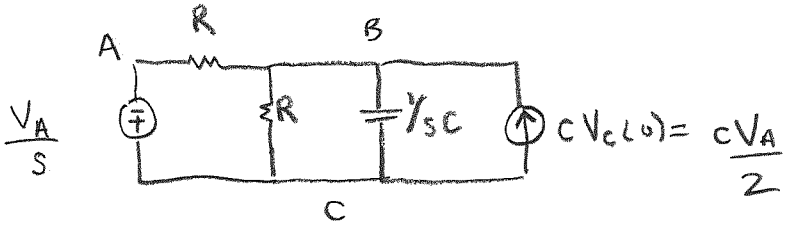
a. [25 pts] **Find**: The initial values of the variables $i_C(t)$ and $v_C(t)$.



$$v_C(0) = V_A \frac{R}{R+R} = V_A/2$$

$$i_C(0) = 0$$

b. [25 pts] **Find**: Transform and redraw the circuit in the s domain for $t \geq 0$. Use **current sources** to represent initial conditions.



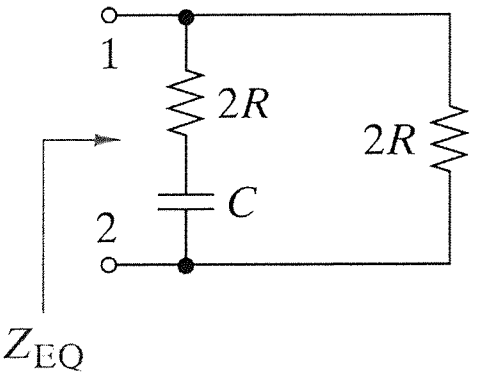
c. [25 pts] **Find**: Write a set of node voltage equations to sufficient to determine the voltage drop across the top resistor. **Do not solve** for the node voltages.

A: $V_A = -\frac{V_A}{S}$

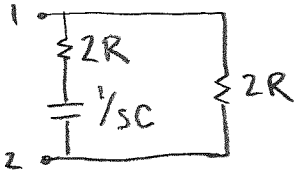
B: $\frac{V_B - (-V_A/S)}{R} + \frac{V_B}{\frac{1}{sC}} + \frac{V_B}{R} - CV_C(0) = 0$

C: $V_C = 0$

2. [20 pts] **Given**: The circuit below in the zero state.



a. [10 pts] **Find**: Transform and redraw the circuit in the s domain.



b. [10 pts] **Find**: The equivalent impedance Z_{EQ}. What are the poles and zeros of the circuit?

$$(2R + 1/sC) \parallel 2R$$

$$= \frac{(2R + 1/sC)(2R)}{2R + 1/sC + 2R} = \frac{4R^2 + 2R/sC}{4R + 1/sC} \quad \frac{sC}{sC}$$

$$= \frac{4R^2Cs + 2R}{4RCs + 1}$$

$$= \frac{4RC}{4RC} \frac{Rs + 1/2C}{s + 1/4RC} = \boxed{R \frac{s + 1/2RC}{s + 1/4RC}}$$

Zero $s = -1/2RC$

Pole $s = -1/4RC$