

Name: _____ (please print)

Signature: _____

ECE 2202 – Quiz 3
September 27, 2022

1. This quiz is closed book, closed notes. You may have one 8.5 x 11" crib sheet.
2. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
4. If the grader has difficulty following your work because it is messy or disorganized, you will lose credit.
5. Do not use red ink. Do not use red pencil.
6. You will have 30 minutes to work on this quiz.

_____ /20

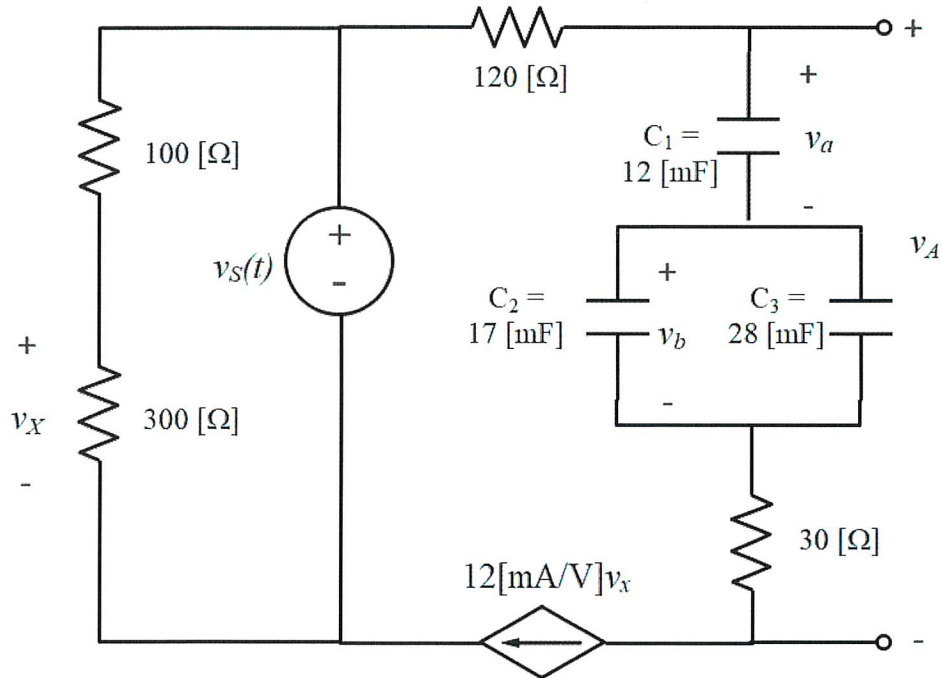
Room for extra work

In the circuit below, the independent voltage source is

$$v_s(t) = 12[\text{V/s}]t \quad t \geq 0.$$

At $t = 0$, the voltage $v_a = -4$ [V], and $v_b = 6$ [V].

Find v_A as a function of time for $t \geq 0$.



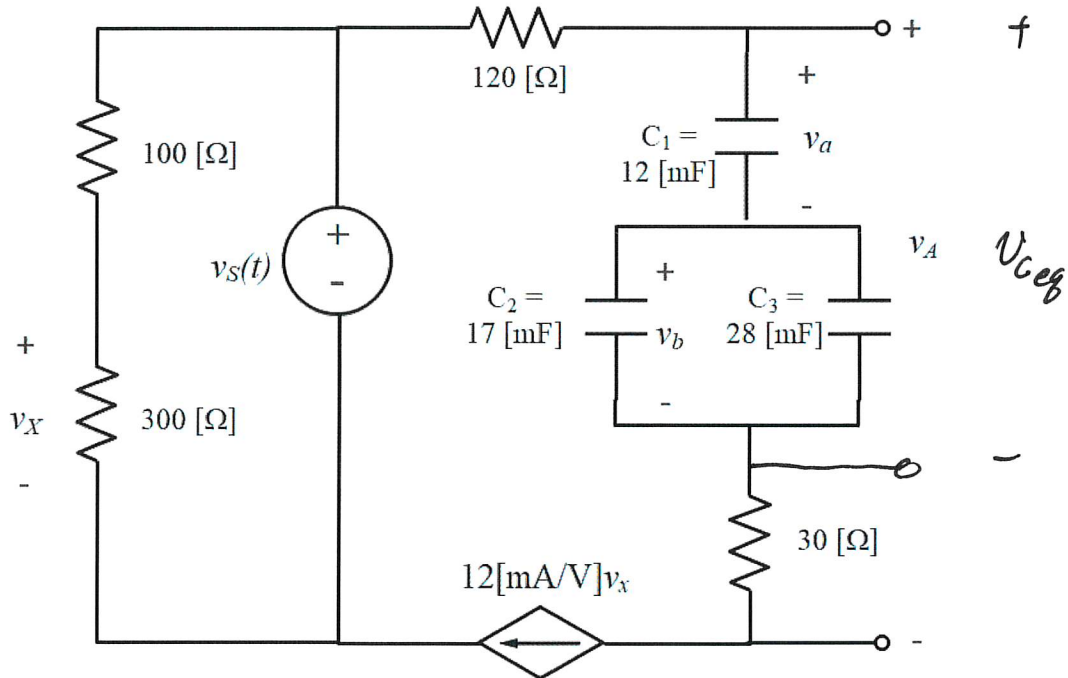
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We know the current through the equivalent capacitance:

$$C_{23} = C_2 \parallel C_3 = 17 [\text{mF}] + 28 [\text{mF}] = 45 [\text{mF}]$$

$$C_{eq} = C_1 + C_{23} = \frac{45 \cdot 12}{45 + 12} = 9.474 [\text{mF}]$$

Define $V_{ceq} \dots$

\nearrow
p9.4

Room for extra work

$$V_{\text{ceq}}(t) = \frac{1}{C_{\text{eq}}} \int_0^t 0.012 V_x(t) dt + V_{\text{ceq}}(0)$$

$$V_{\text{ceq}}(0) = V_a(0) + V_b(0) = 2 \text{ [V]}$$

$$V_x(t) = V_s(t) \cdot \frac{3}{4} = 9t$$

$$\begin{aligned} V_{\text{ceq}}(t) &= \frac{1}{9.474 \times 10^{-3}} \int_0^t 0.012 \left[\frac{\text{A}}{\text{V}} \right] 9 \left[\frac{\text{V}}{\text{s}} \right] t dt + 2 \text{ [V]} \\ &= 5.700 t^2 \int_0^t + 2 \text{ [V]} = 5.700 \frac{\text{V}}{\text{s}^2} t^2 + 2 \text{ [V]} \end{aligned}$$

$$V_A(t) = V_{\text{ceq}}(t) + 0.012 V_x \cdot 30$$

$$= 5.700 \left[\frac{\text{V}}{\text{s}^2} \right] t^2 + 2 \text{ [V]} + 3.24 \left[\frac{\text{V}}{\text{s}} \right] t$$