Massachusetts Institute of Technology
Department of Electrical Engineering and Computer Science

6.200 – Circuits & Electronics
Spring 2026

Quiz #2

22 April 2026

Name: ____

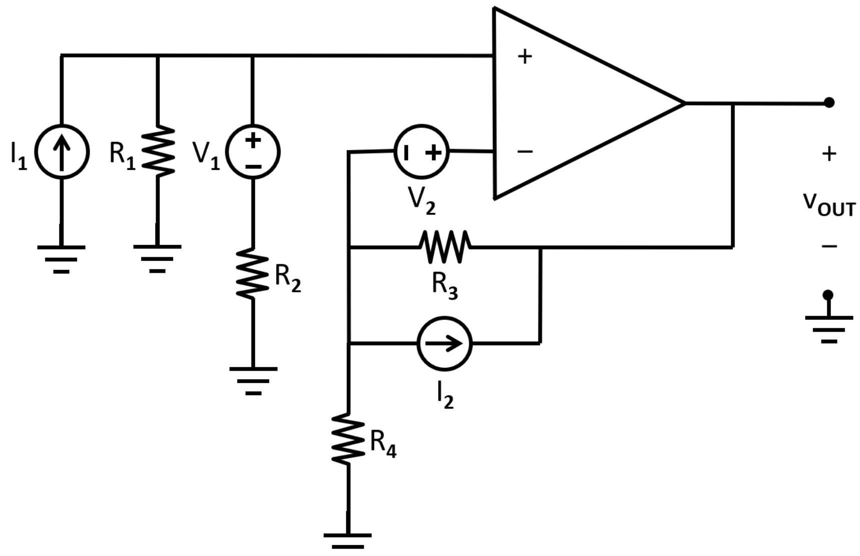
MIT EMail: ______________________ @MIT.EDU

Recitation Time: 12 1 2

- There are 15 pages in this quiz, including this cover page.
- Please put your name and MIT EMail ID in the spaces provided above, and circle the time of your recitation.
- Please do not remove any pages from this quiz.
- Do your work for each question within the boundaries of that question, or on the back of the preceding page. *When finished with each part, clearly write your answer for that part into the corresponding answer box or graph.*
- *All numerical answers require proper units.*
- *In order to guarantee receipt of full credit, all answers should be justified by supporting math and/or explanations.*
- This is a closed-book closed-electronics quiz but a single two-sided page of notes is allowed.
- Good luck!

Problem 1: Op-Amp Amplifier - 6%

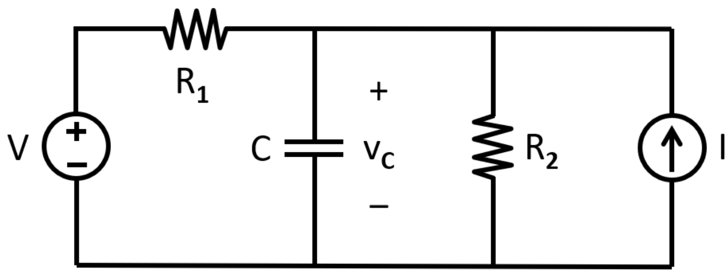
Shown below is an op-amp amplifier. Assume that the op amp is ideal and determine v_{OUT}.



v_{OUT}:

Problem 2: Capacitor Dynamics - 15%

The circuit shown below comprises two sources, two resistors and one capacitor. Assume that prior to time $t = 0$ the conditions $V = 0$ and constant $I \neq 0$ have been established for a very long time such that the circuit operates in steady state by $t = 0$.



(2A) Determine v_C at $t = 0$.

$v_C(0)$:

(2B) At $t = 0$, the voltage source steps to a constant such that $V \neq 0$. Determine $v_C(t)$ for $t \geq 0$.

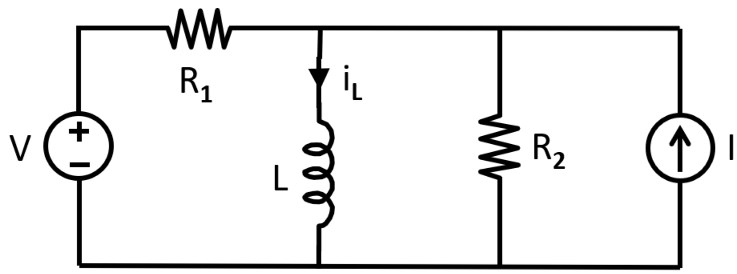
$v_{\mathrm{C}}(t \geq 0)$:

(2C) At $t = T$ with $T > 0$, the current source steps such that $I = 0$. Determine $v_C(t)$ for $t \geq T$.

$v_{\mathrm{C}}(t \geq T)$:

Problem 3: Inductor Dynamics - 15%

The circuit shown below comprises two sources, two resistors and one inductor. Assume that prior to time $t = 0$ the conditions constant $V \neq 0$ and $I = 0$ have been established for a very long time such that the circuit operates in steady state by $t = 0$.



(3A) Determine i_{L} at $t = 0$.

$i_{\mathrm{L}}(0)$:

(3B) At $t = 0$, the current source steps to a constant such that $I \neq 0$. Determine $i_L(t)$ for $t \geq 0$.

$i_{\mathrm{L}}(t \geq 0)$:

(3C) At $t = T$ with $T > 0$, the voltage source steps such that $V = 0$. Determine $v_C(t)$ for $t \geq T$.

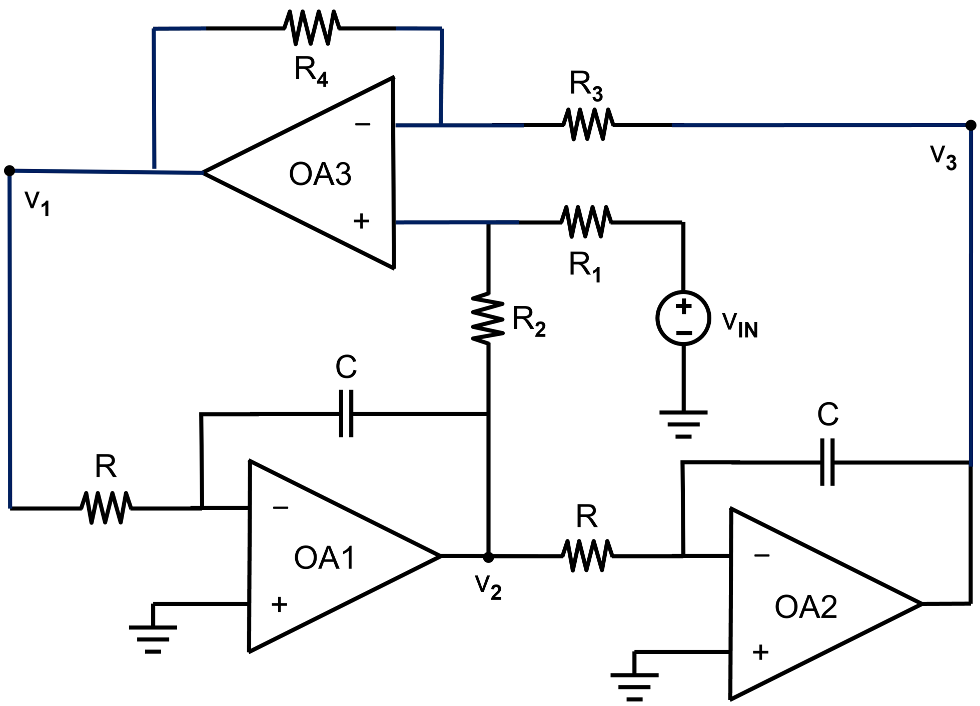
$i_{\mathrm{L}}(t \geq T)$:

Problem 4: Analog Computer – 40%

The circuit shown below can function as an analog computer, solving the second-order differential equation

$$A_2 d^2x/dt^2 + A_1 dx/dt + A_0 x = v_{\text{in}} \quad . \tag{1}$$

Assume its op-amps are ideal.



(4A) Considering the operation of op amps OA1 and OA2, determine both v_2 and v_3 in terms of v_1 and the circuit parameters.

v_2:	v_3:

(4B) Considering the operation of op amp OA3, determine v_1 in terms of v_2, v_3, and v_{IN}.

v_1:

(4C) Which of the voltages v_1, v_2, and v_3 should correspond to x in the differential equation? Briefly explain your reasoning.

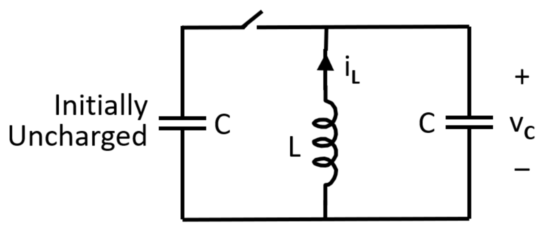
Selected voltage:
Explanation:

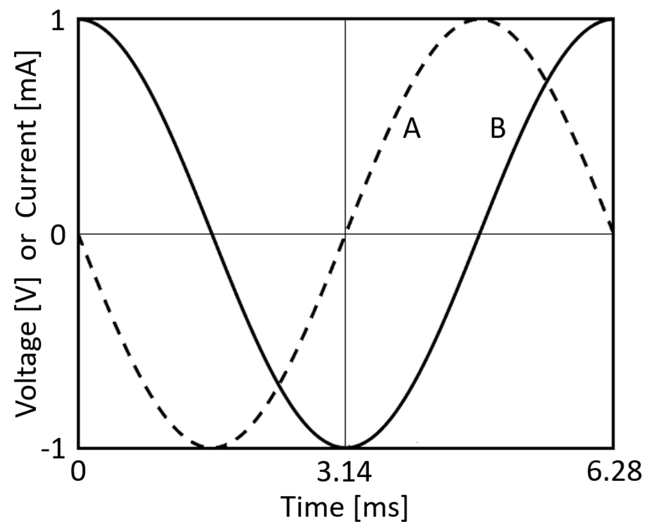
(4D) Following your answer to Part (4C), which matches a voltage to x, match the operation of the circuit to the differential equation above. In doing so determine A_0, A_1, and A_2 in terms of the circuit parameters.

A_0:
A_1:
A_2:

Problem 5: LC Oscillations – 24%

Consider the circuit shown below comprising two capacitors, one inductor, and one switch. The switch is initially open thereby disconnecting one capacitor from the remainder of the circuit. The disconnected capacitor is uncharged. The graph below displays two sinusoidal waveforms, labeled "A" and "B". One waveform shows the capacitor voltage v_C as a function of time while the other waveform shows the inductor current i_L. Note that the vertical axis is accordingly labeled in both voltage and current.





(5A) Which waveform corresponds to the capacitor voltage v_C? (The other waveform therefore corresponds to the inductor current i_L.) Circle the appropriate answer and provide a brief explanation.

v_C waveform:	A	B
Explanation:		

(5B) Determine values for both C and L.

C:	L:

(5C) Determine the total energy in the system.

Total energy:

(5D) Assume that the switch closes at a point in time at which $v_C = 0$. Determine values for the peak v_C, the peak i_L, and the period of oscillation after that time.

New peak v_C:
New peak i_L:
New period: