EECS / CSE 70A MIDTERM #2

GRADING RUBRIC

Each incorrect or missing units or incorrect result causes loosing 1 point.

Problem 1.

Step	Points
Recognize virtual ground in the opamp inputs ($V_+ = V_-$) due to opamp infinite gain and correct voltage at both opamp pins	4
Recognizing the opamp ports do not draw any current (infinite R_{in})	2
Write KCL at the opamp negative input pin	2
Finding I_1 (formula (1 point) and result (2 points))	3
Finding I_2 (formula (1 point) and result (2 points))	3
Finding I_3 (formula (1 point) and result (2 points))	3
KVL to find the output voltage	1
Find output voltage	2
Total	**20**

Problem 2.

Step	Points
Recognize that the capacitor is open circuit at $t = 0^-$	2
Find $V_C(t = 0^-)$ (using KVL/KCL) and final result	4
Find $i(t=0^-)$ (using KVL/KCL) and final result	4
Recognize that 3kΩ and source voltage are open circuited at $t = 0^+$	2
After switch is open, recognizing correct equivalent resistance	3
Finding the correct time constant value (formula and final result)	3
Recognize source free discharge or why $V_C(\infty) = 0$ and $i(t=\infty) = 0$	2 + 2
Give the generic formula for $V_C(t)$ and $i(t)$ when $t > 0$	2 + 2
Correct results for $V_C(t)$ and $i(t)$	2 + 2
Total	**30**

Problem 3.

Step	Points
Recognize that the inductor is short circuit at $t = 0^-$	2
Find $i_2(t=0^-)$ (using KVL/KCL) and final result	3
Find $i_L(t = 0^-)$ (using KVL/KCL) and final result	3
Recognize that 6Ω and source voltage are open circuited at $t = 0^+$	2
For transient period, writing the correct time constant equation	2
After switch is open, recognizing correct equivalent resistance	3
Finding the correct time constant value (formula and final result)	3
Recognize source free discharge or why $i_L(\infty) = 0$ and $i_2(t=\infty) = 0$	2 + 2
Give the generic formula for $i_L(t)$ and $i_2(t)$ when $t > 0$	2 + 2
Write KCL to find $i_2(t)$ relationship with $i_L(t)$	2
Correct results for $V_C(t)$ and i(t)	2
Total	**30**

Problem 4.

Step	Points
Recognize virtual ground in the opamp inputs ($V_+ = V_-$) due to infinite opamp gain and correct voltage at both opamp pins	4
Recognizing the opamp ports do not draw any current	2
Finding $i_S(t)$ (ohms law at the opamp (1 point) input and final result (2 points))	3
Write KCL at the opamp negative input pin	1
Finding the current passing through the capacitor	2
Writing the differential equation for voltage and current of the capacitor	3
Integrating the differential equation to find the final result at t = 2	3
Final capacitor voltage value	2
Total	**20**