Homework 4

Due data: Apr.11st

Turn in your homework in class

Rules:

- Please work on your own. Discussion is permissible, but extremely similar submissions will be judged as plagiarism!
- Please show all intermediate steps: a correct solution without an explanation will get zero credit.
- Please submit on time. No late submission will be accepted.
- Please prepare your submission in English only. No Chinese submission will be accepted.

1

[14 points]The circuit is shown in **Fig.1**. The switch has been closed long enough before $t = 0s$ and is opened at $t = 0s$. Determine the response of V(t) for $t \geq 0$.

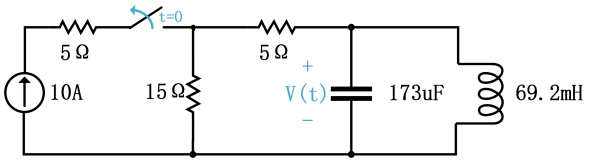

Figure 1:

2

[14 points]The circuit is shown in **Fig.2**. The circuit has reached steady state before $t = 0$. Determine the response of i(t) for $t \geq 0$.

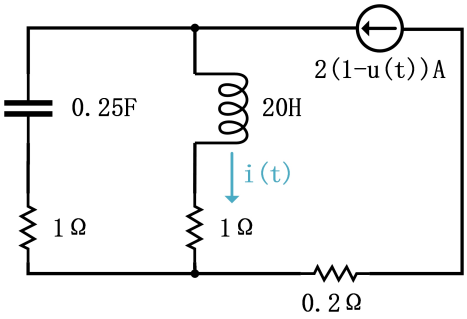

Figure 2:

3

[14 points]The circuit is shown in **Fig.3**. There is no energy stored in the capacitor when $t < 0$. Determine the response of V(t) for $t \geq 0$.

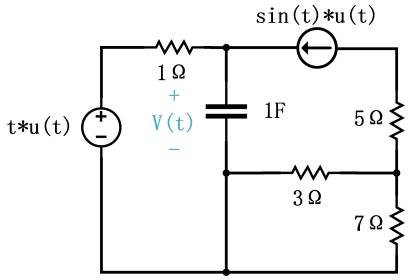

Figure 3:

4

[15 points]The circuit is shown in **Fig.4**. There is no energy stored in the capacitor when $t < 0$. And the energy stored in the inductor at $t = 0$ is $3.125J$. Determine the response of V(t) for $t \geq 0$. (Hint: you can use Thevenin equivalence to first simply the circuit at terminals of series LC)

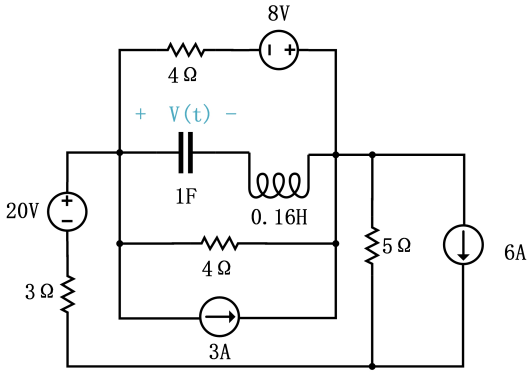

Figure 4:

5

[14 points]The circuit is shown in **Fig.5**. $v_{C1}(0-) = -3\text{V}$,$v_{C2}(0-) = 2.5\text{V}$. And $R_1 = 10k\Omega, R_2 = 5k\Omega, C_1 = 100\mu\text{F}$,$C_2 = 200\mu\text{F}$. For $t < 0s, v_i(t) = 0\text{V}$. Assume that the operational amplifier is ideal and works in its linear region.
(a)Find the differential equation of v_o for $t \geq 0$ with v_i, R_1, R_2, C_1, C_2.
(b)Solve the equation aquired in (a) with $v_i = 5u(t)\text{V}$.

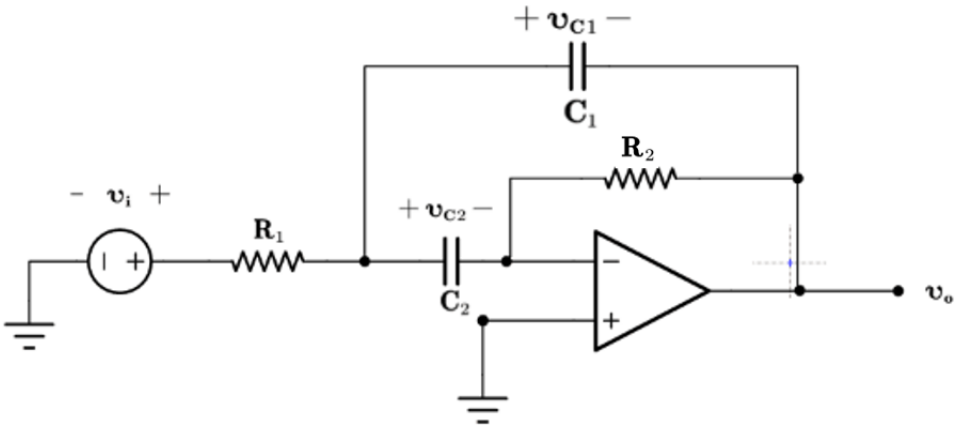

Figure 5:

6

[14 points]The circuit is shown in **Fig.6**. The swith has been closed long enough before $t = 0s$ at **a**, and it is switched to **b** at t=0s. Determine the voltage $v(t)$ of the current sorce I_2 for $t \geq 0s$.

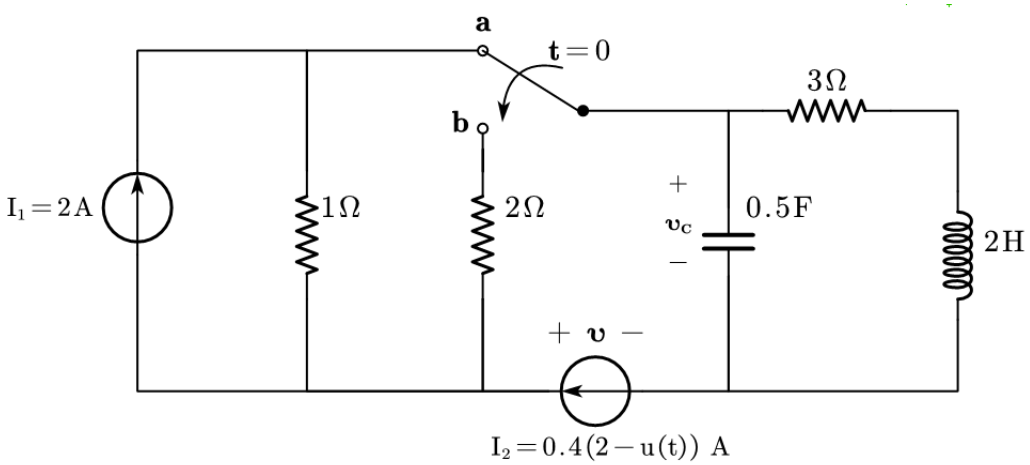

Figure 6:

7

[15 points]The circuit is shown in **Fig.7**. The swith has been closed long enough before t=0s at **a**, and it is switched to **b** at t=0s. $I_s(t) = te^{-t}u(t) + 4u(-t)$ A, $V_s(t) = e^{-2t}cos(5t + \frac{\pi}{3})u(t)$ V. Determine the current $i(t)$ for $t \geq 0s$.

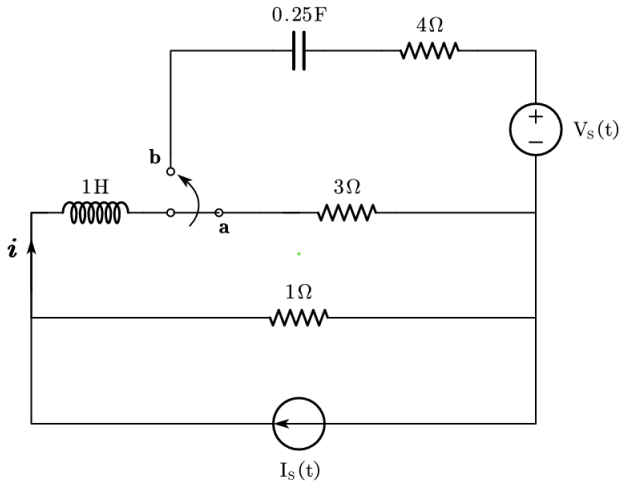

Figure 7: