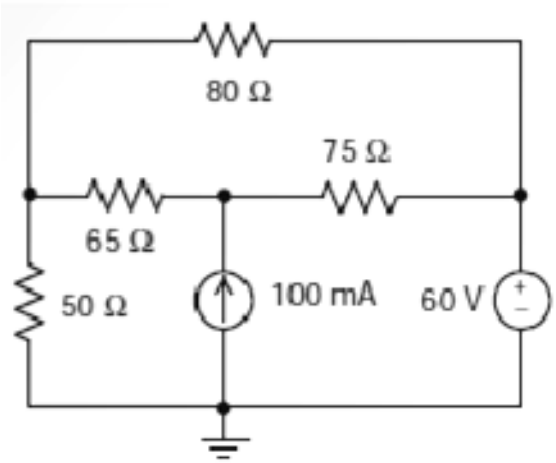
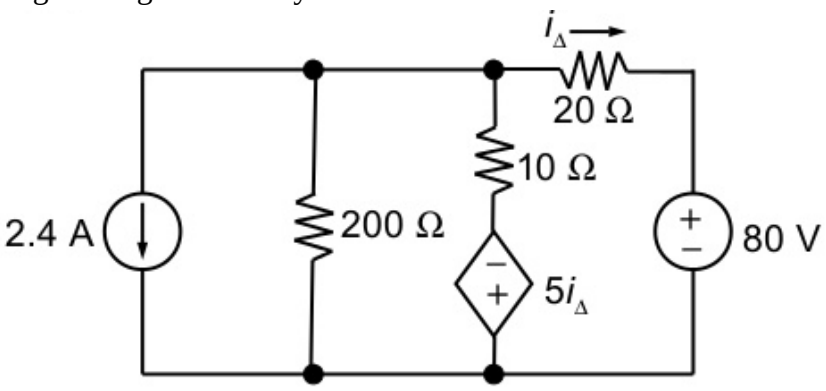
Assignment No. 3

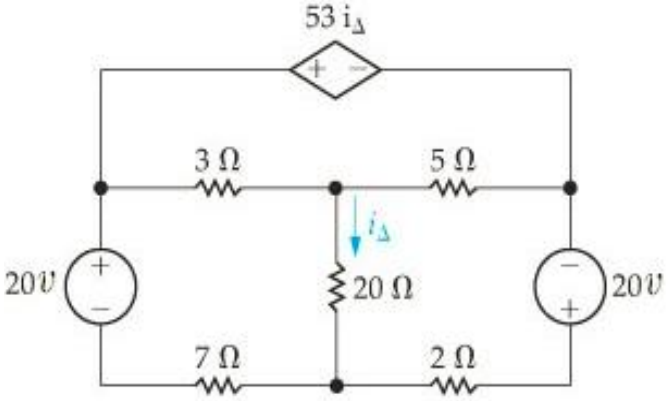
1. Find Node voltages using Node analysis:



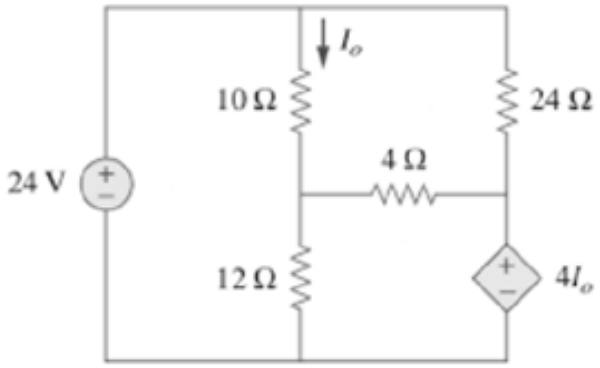
2. Find Node voltages using nodal analysis:



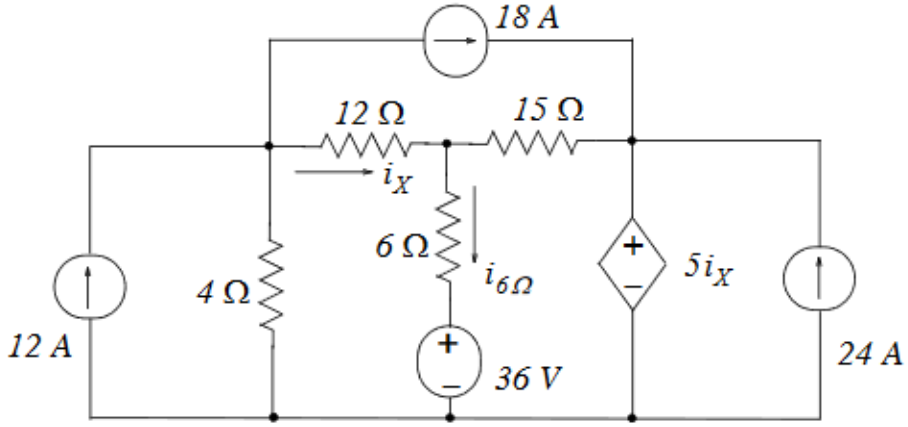
3. Find Mesh currents using mesh analysis.



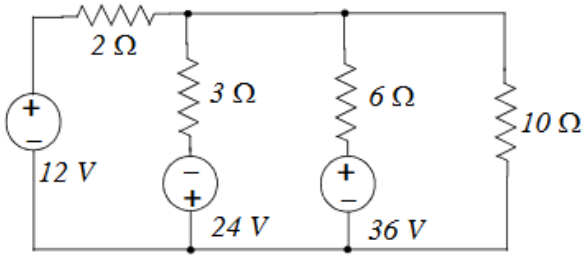
4. Find Mesh currents using mesh analysis.



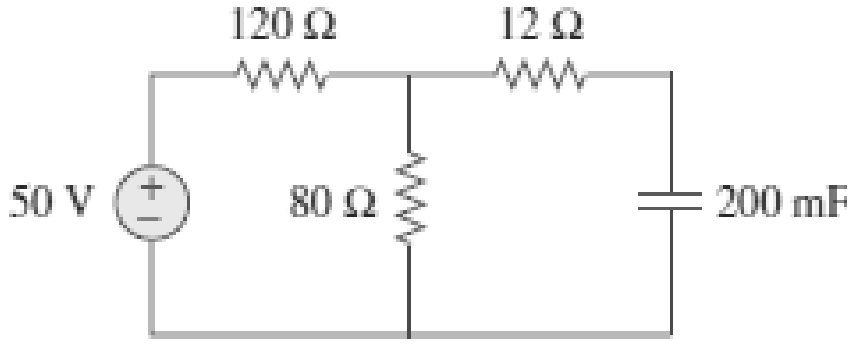
5. Find
   a. node voltages using Node analysis
   b. mesh currents using mesh analysis:



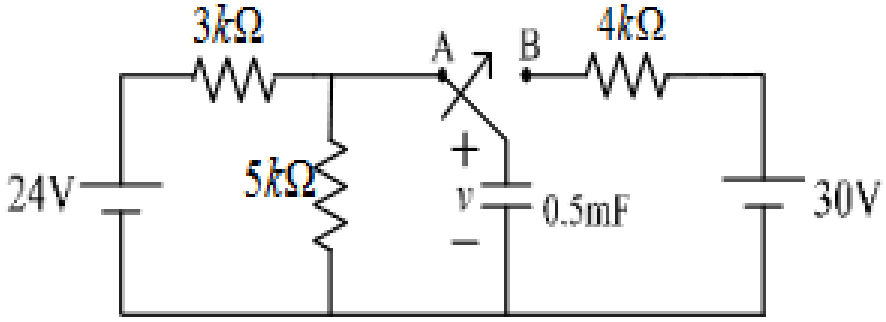
6. Find
   a. node voltages using Node analysis
   b. mesh currents using mesh analysis:



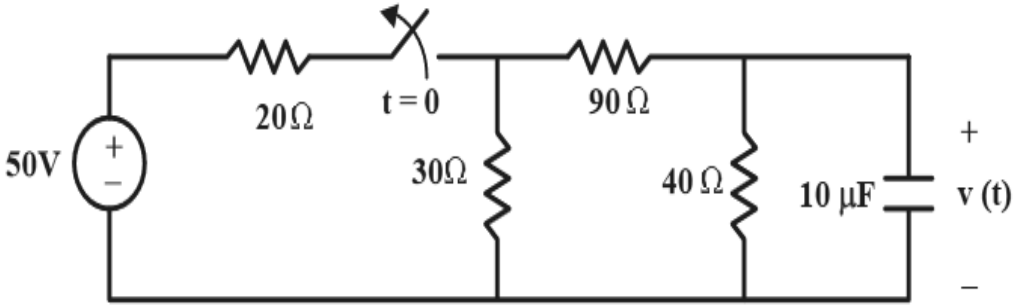
7. Find voltage and energy of capacitor



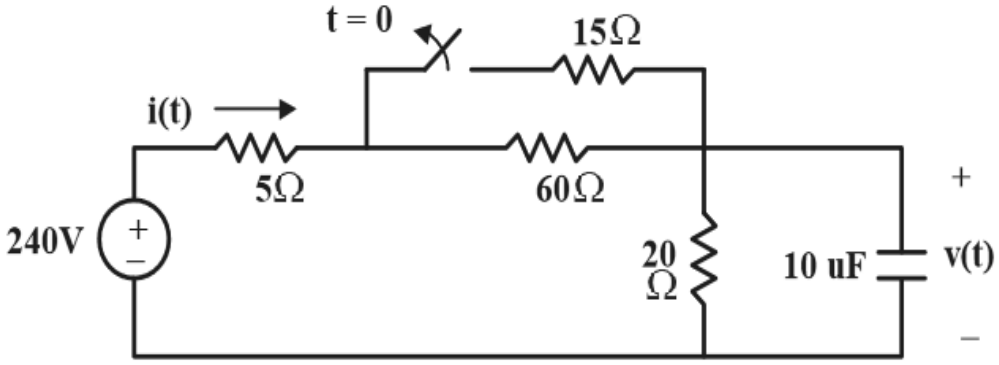
8. Find the response ‘v(t)’ of capacitor



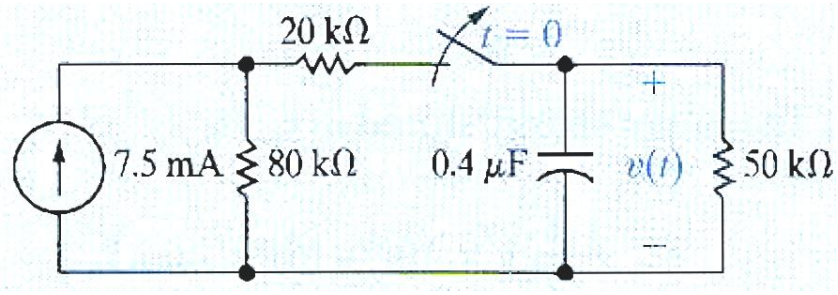
9. The switch in the below circuit has been closed for a long time and is opened at t=0. Find the response ‘v(t)’ of the capacitor



10. The switch in the below circuit has been closed for a long time and is opened at t=0. Find the response 'v(t)' and current 'i(t)' in the following circuit

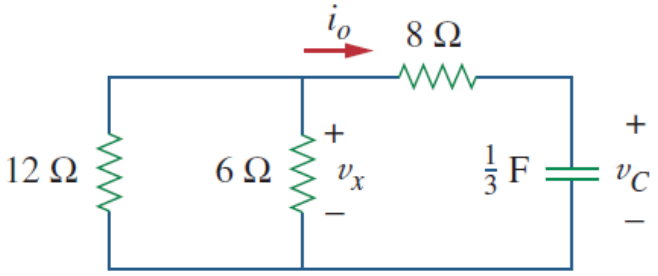


11. The switch in the below circuit has been closed for a long time and is opened at t=0. Find:
    a) The initial value of V(t)
    b) The time constant for t > 0
    c) The numerical expression for V(t) after the switch has been opened



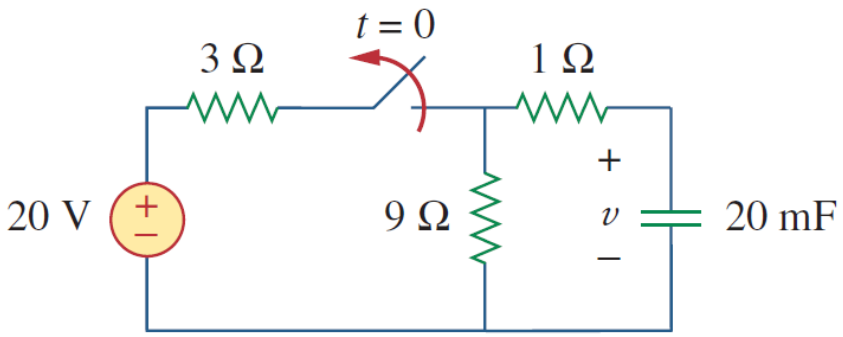
Answer: (a) 200 V;
(b) 20 ms;
(c) $200e^{-50t}$ V, $t \geq 0$;

12. Let Vc(0) = 60V. Determine Vc, Vx and i_o for t $\geq$ 0.



Answer: $60e^{-0.25t}$ V, $20e^{-0.25t}$ V, $-5e^{-0.25t}$ A.

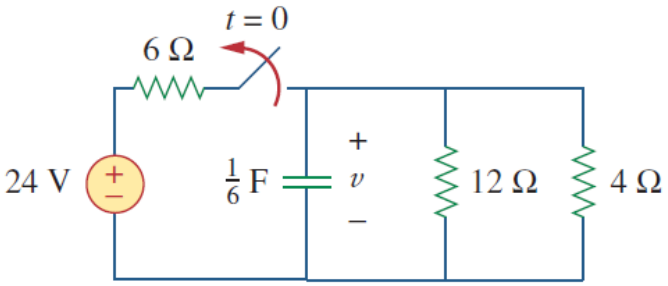
13. The switch in the circuit has been closed for a long, and it is opened at t = 0. Find V(t) for t $\geq$ 0. Calculate the initial energy stored in the capacitor.



Answer: $w_C(0)$ 2.25 J

$v(t) = 15e^{-5t}$ V

14. If the switch in the below circuit open at t = 0, find V(t) for t $\geq$ 0 and also initial energy stored in the capacitor.



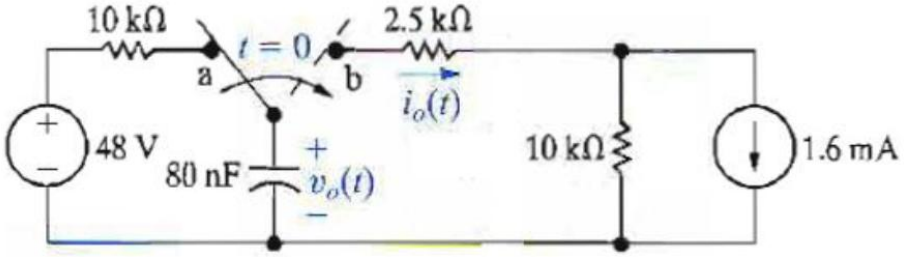
Answer: $8e^{-2t}$ V, 5.333 J.

15.

The switch in the circuit given below has been in position 'a' for a long time. At $t = 0$, the switch is moved to position 'b'.

a) Find $V_o(t)$ for $t \geq 0$

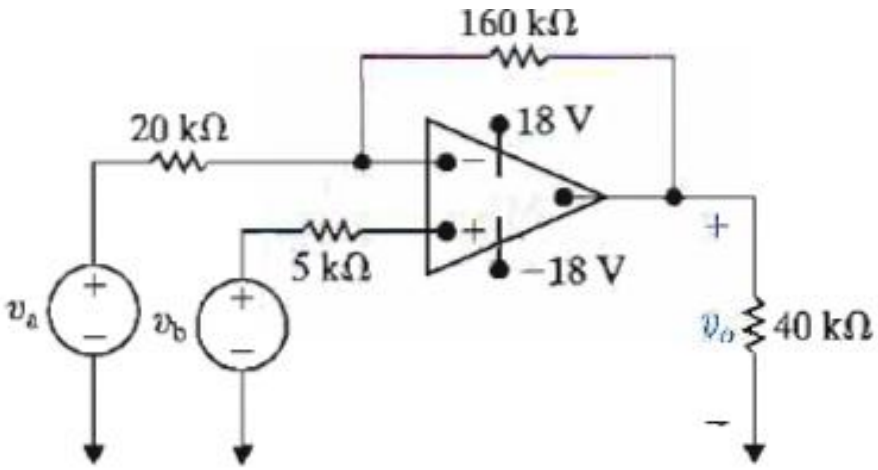
b) Find $i_o(t)$ for $t \geq 0^+$



Answer: $V_o(t) = -16 + 64\,e^{-1000t}$ V,

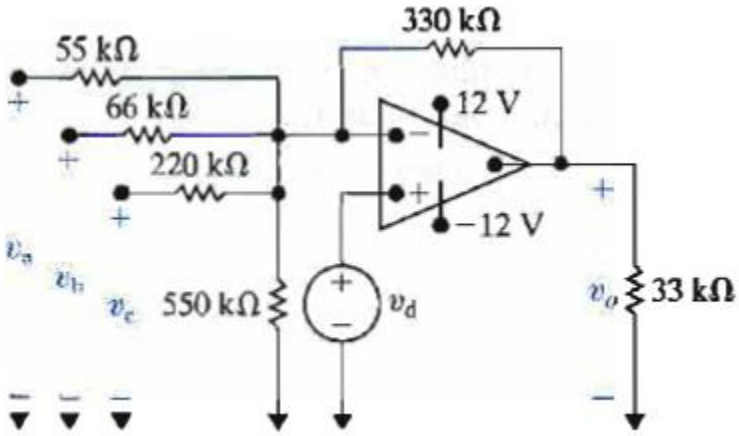
$i_o(t) = 5.12\,e^{-1000t}$ mA

16. The Op-Amp in the circuit is Ideal. Calculate $v_o$if $v_a = 1.5v$ and $v_b = 0v$. If $v_b = 4.5v$, specify the range of v_a such that the amplifier does not saturate.

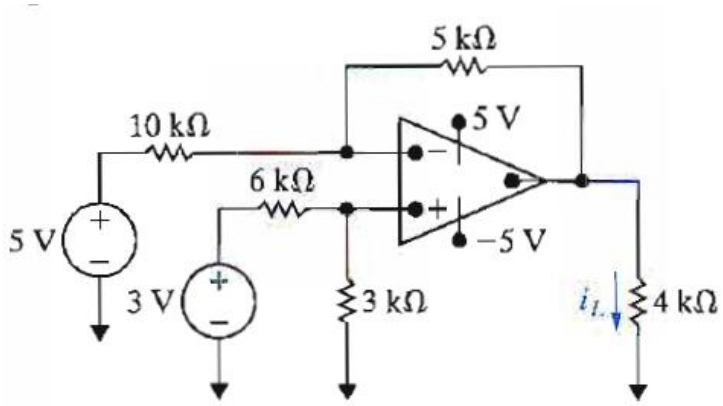


17. The Op-Amp in the circuit is ideal. Find v_o if $v_a = 16v$, $v_b = 12v$, $v_c = -6v$ and $v_d = 10v$.

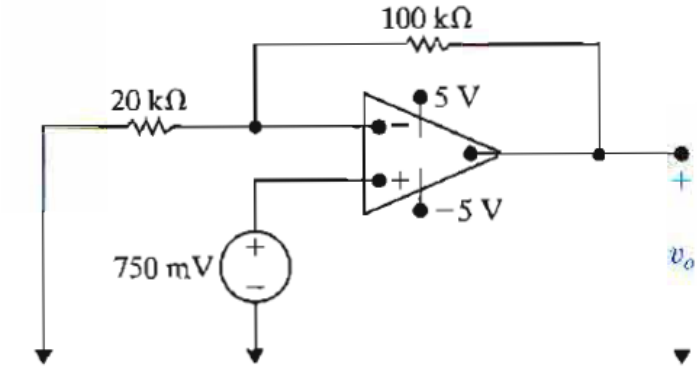
If all the voltage sources except v_b retain their values, specify the range of v_b such that Op-Amp operates with in linear region.



18. Find i_L in micro amps



19. The op amp of the following circuit is Ideal.
    a) What op amp configuration is this?
    b) Calculte Vo



20. The input to the following network is given below. Find and sketch v_o if $v_o(0) = 0$