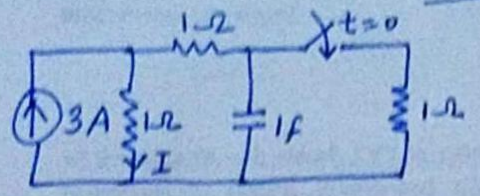
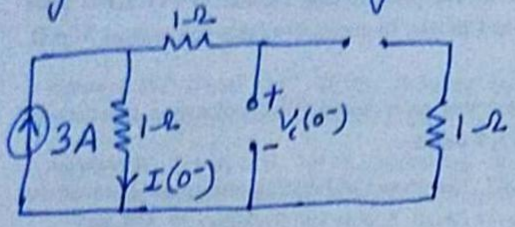
Solution tut 1

(1)



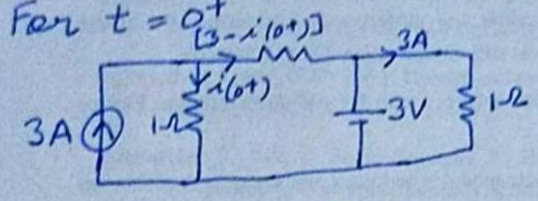
Finding initial voltage & current



$I(0^-) = 3A$

$V(0^-) = 3V$

For $t = 0^+$

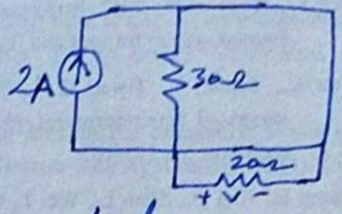


$\Rightarrow 3 = -1[3 - i(0^+)] + 1 * i(0^+)$

$3 = -3 + 2i(0^+)$

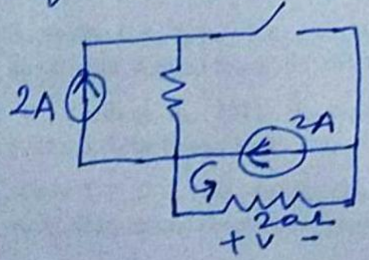
$i(0^+) = \frac{6}{2} = 3A$ Ans

(2) The situation at $t = 0^-$ inductor is S.C.
So, 20Ω will get S.C.
Then, 30Ω parallel with S.C.



Here $i_L(0^-) = i_L(0^+) = 2A$ [means whole current passes through SC path]

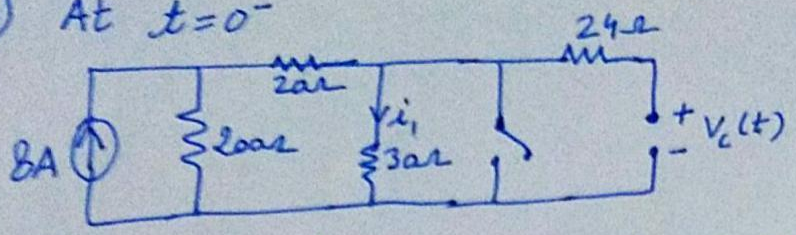
Now, to find $V(0^+)$ the circuit



$\Rightarrow$ means 2A current flows through 20Ω Resistance

So, $V(0^+) = 2 \times 20 = 40V$

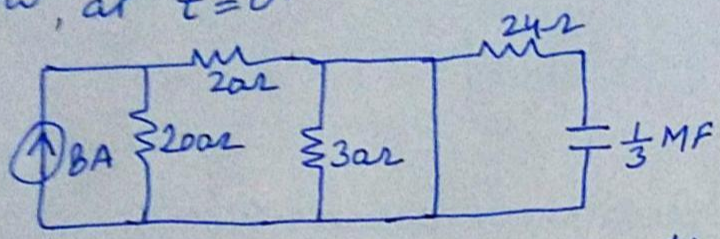
(3) At $t=0^-$



Means $V_c(0^-)$ is same as across 3Ω

So, $i_1 = \frac{8\times 200}{200+50} = \frac{32}{5}A$, $V_c(0^-) = 30\times\frac{32}{5} = 192V$

Now, at $t=0^+$



So, capr starts discharging through S.C. path

$V(t) = V_0 e^{-t/RC} = 192 e^{-t/24\times\frac{1}{3}\times10^{-3}}$

$= 192 e^{-125t}$

or

$V(\infty) = 0$

So, $V(t) = 0 - [(0-192)]e^{-t/24\times\frac{1}{3}\times10^{-3}}$

$= 192e^{-125t}$ Ans

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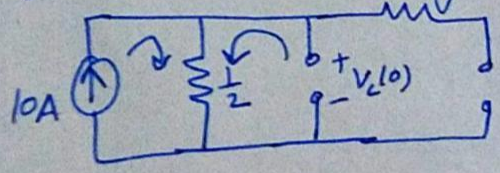
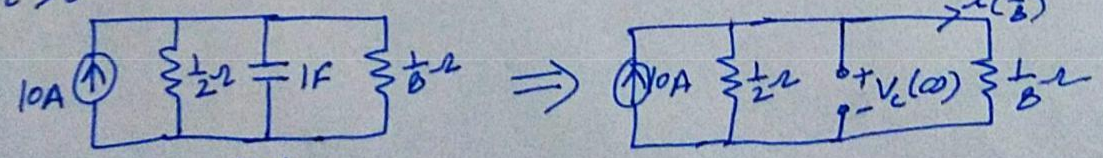
(4) To find initial voltage across capr



$\Rightarrow V_c(0^-) = 5V$

For $t>0$



So, $i(\frac{1}{8}) = \frac{10\times1/2}{\frac{1}{2}+\frac{1}{8}} = 8A$, $V_c(\infty) = \frac{1}{8}\times 8 = 1V$, $R_{th} = \frac{1}{2}//\frac{1}{8} = \frac{1}{10}$

Now, $V_c(t) = 1-(1-5)e^{-t/R_{th}C} = 1+4e^{-10t}$ Ans