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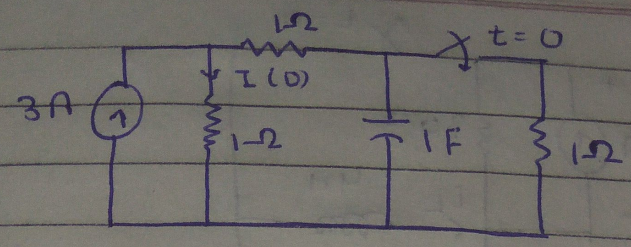
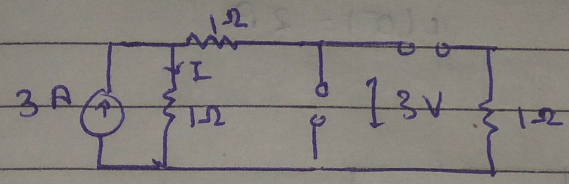
TS-1

(1)



find I for t=0.

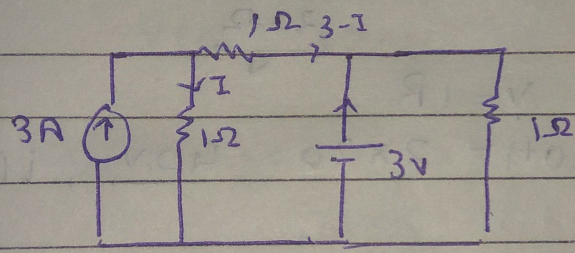
AND t=0,



$V = IR$

$= 3 \times 1$

$= 3V$



$1(I) + 1(3-I) = 3$

$I + 3 - I = 3$

$I - (3-I) = 3$

$I - 3 + I = 3$

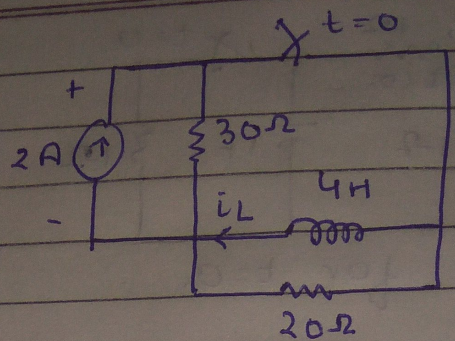
$2I = 6$

$I = 3$

Ckt remains in steady state

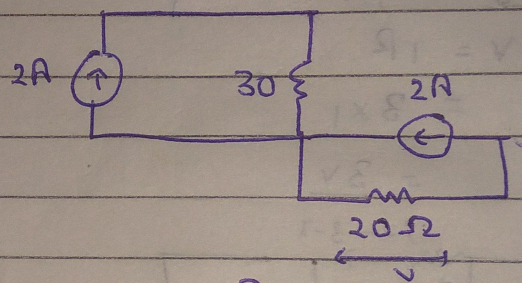
$0 = (a)V$

(b)



+ (v) -

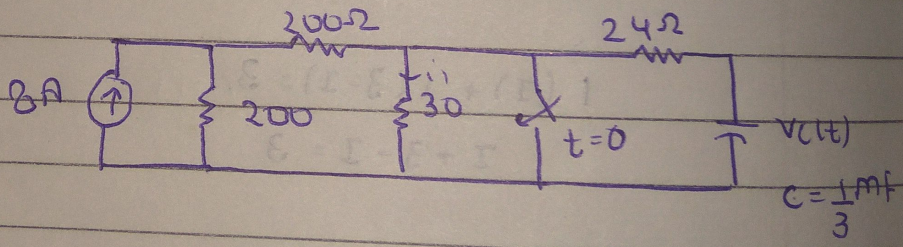
$t=0^-$, $i(0^-) = 2A$



$\therefore V = IR$

$v(0^+) = 2 \times 20 = 40V$; $i(0^+) = 2A$

(3)



$$V_c(t) = V(\infty) + [V(0) - V(\infty)]e^{\frac{-t}{\tau}}$$

$$i_1 = \frac{200 \times 8}{200+50} = 6.4A$$

$$V(0) = 6.4 \times 30$$

$$= 192$$

$$V(\infty) = 0$$

$$R_{Th} = RC$$

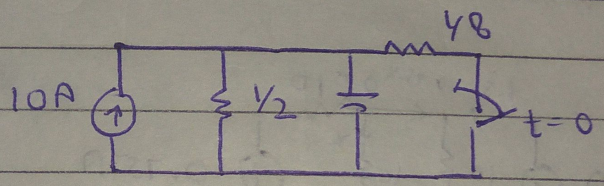
$$= 24 \times \frac{1}{3} \times 10^{-3}$$

$$= 8 \times 10^{-3}$$

$$v_C(t) = 192 e^{-\frac{t}{8 \times 10^{-3}}}$$

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

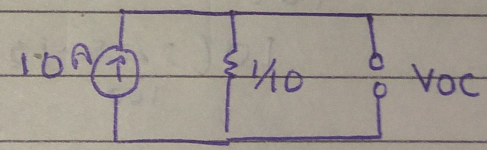
(4)



$$v(0) = \frac{10 \times 1}{2} = 5V$$

$$R_{th} = \frac{1}{10}$$

$v(\infty) =$



$$v(\infty) = V_{oc} = 10 \times \frac{1}{10} = 1V$$

$$v_L(t) = v(\infty) + [v(0) - v(\infty)] e^{-\frac{t}{\tau}}$$

$$= 1 + 4e^{-\frac{t}{10}}$$

$$= (1 + 4e^{-10.0t})\ V$$

$$= \frac{255}{5}$$

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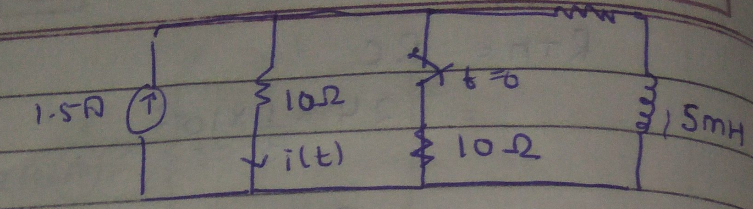
(5)

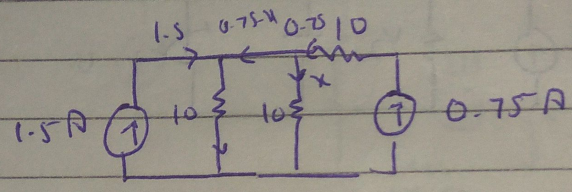


i(t)

$V = 1.5 \times 10$

$= 15V$

$i_L(0^-) = 0.75A$



$10(1.5 + 0.75 - x) = 10x$

$10\left(\frac{225}{100} - x\right) = 10x$

$22.5 - 10x = 10x$

$20x = 22.5$

$x = \frac{22.5}{20}$

$i = 1.5 + 0.75 - x$

$= \frac{225}{100} - \frac{225}{200}$

$= 225\left[\frac{100}{200}\right]$

$= \frac{225}{2} = 112.5$

1.5
0.75
2.2

$\frac{1}{20} + \frac{1}{10}$

$\frac{1+2}{20}$

$\frac{20}{3}$

0.500
0.375
0

2000
a

1.5mH

$1.5 = 2\,i(0) + 0.75$

$i(0) = 0.375\,A$

$i(\infty) = 0.5 \quad \left(\frac{1.5}{3}\right)$

$\therefore \quad i(t) = I(\infty) + [I(0) - I(\infty)]e^{-\frac{t}{\tau}}$

$= 0.5 + [0.375 - 0.5]e^{-\frac{t}{\tau}}$

$R_{th} = \frac{10}{3}$ $\qquad R_{th} = 15$

$\frac{L}{R} = \frac{15}{10} \times 3 = \frac{3}{2} \times 10^{-3}$

$= \frac{15}{10_2} \times 3 = \frac{9}{2}$

$\frac{1}{20} + \frac{1}{10}$

$\frac{1+2}{20}$

$\frac{20}{3}$

$i(t) = 0.5 - 0.125e$

0.500
0.375
0

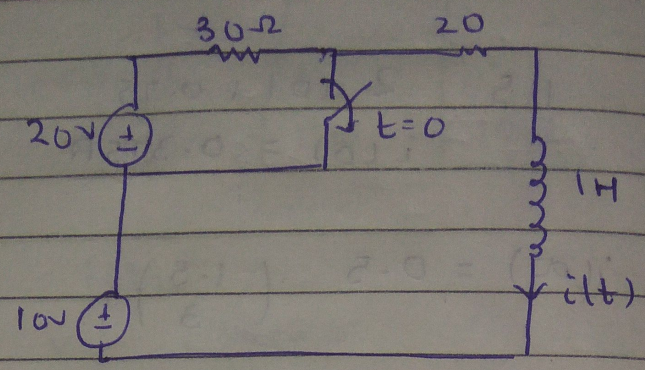
$\frac{L}{R} = \frac{15\,mH}{15} = 1\,mH = 10^{-3}$

2000
a

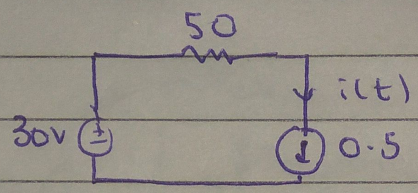
$i(t) = 0.5 - 0.125e$

$\frac{V}{R} = 1$

(6)



$$I = \frac{V}{R} = \frac{10}{20} = 0.5\ A$$



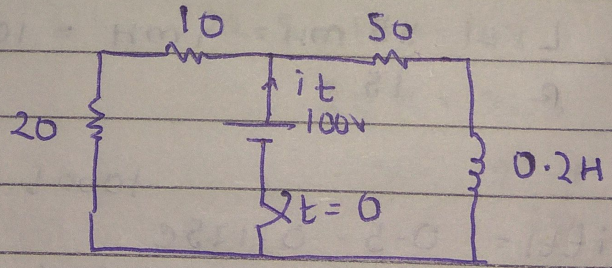
$$i(\infty) = \frac{30}{50} = 0.667$$

$$i(t) = 0.66 + [0.5 - 0.6]e^{-50t}$$

$$= 0.6 - 0.1e^{-50t}$$

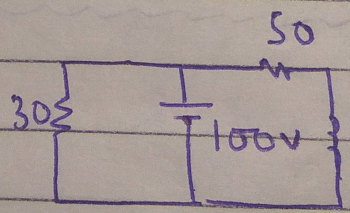
(8)

(7)



800

Ans



$$R = \frac{1}{30} + \frac{1}{50} = \frac{150}{8}$$

$$I = \frac{V}{R} = \frac{200}{150} \times 8 = \frac{16}{3}\ A$$

$v(\infty) = 0\ V$

$i(0) = \frac{16}{3} \times \frac{30}{80}^{10}$

$= 2A$

$i(t) = 0 + (2-0)e^{-\frac{t}{\tau}}$

$= 2e^{-400t}$

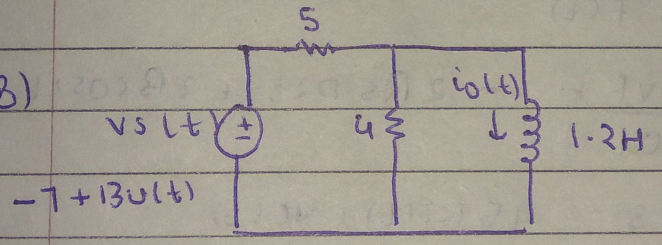
$R_{Th} = 50 + 30 = 80$

(c) $0.5 \times 2 = 2e^{-400t}$

$t = 1.73ms$

50t

(B)



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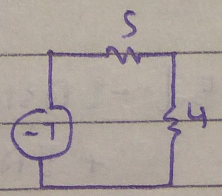
$t = 0^-$

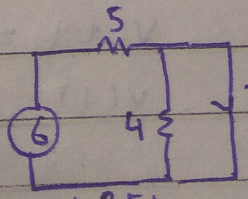


$\frac{1}{5} + \frac{1}{4}$

$\frac{4+5}{20} = \frac{20}{9}$

$i(0^-) = \frac{-7}{5} = -1.4A$

$i(\infty) =$



$= \frac{6}{5} = 1.2A$

$i(t) = 1.2 + (-1.4 - 1.2)e^{-1.85t} = \boxed{1.2 - 2.6e^{-1.85t}}$

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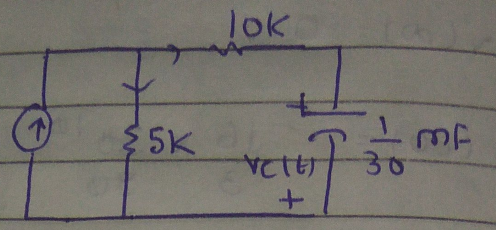
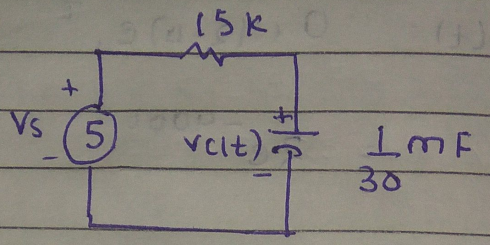
(a)



Ans



$$v_c(t) = De^{-2t}$$

$$v_c(0) = 0 = -De^{-0} + 5 + 0 \Rightarrow D = -5$$

$$\underbrace{2\cos 2t}_{f(t)}, \quad v_F = A\cos 2t + B\sin 2t$$

$$\frac{dv_f}{dt} = -2A\sin 2t + 2B\cos 2t$$

$$v_s = 15k\,i(t) + v_c(t)$$

$$= 15\times 1k\,C\frac{dv_c(t)}{dt} + v_c(t)$$

$$10\cos 2t = 0.5[-2A\sin 2t + 2B\cos 2t] + [A\cos 2t + B\sin 2t]$$

$$A + B = 10, \quad 0 = -A + B$$

$$A = 5, B = 5$$

$$v(t) = 5\cos 2t + 5\sin 2t + De^{-2t}$$

$$v(t) = 5\cos 2t + 5\sin 2t - 5e^{-2t}$$

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(i)

(ii)