Attribution Nidhal Abdulaziz

ENGG104 Tutorial 7 Class Questions

Team Name: _____

Question 1 [typical exam question]

For the network in Fig. 85:

a. Determine the mathematical expressions for the current i_L and the voltage v_L when the switch is closed.

b. Repeat part (a) if the switch is opened after a period of five time constants has passed.

c. Sketch the waveforms of parts (a) and (b) on the same set of axes.

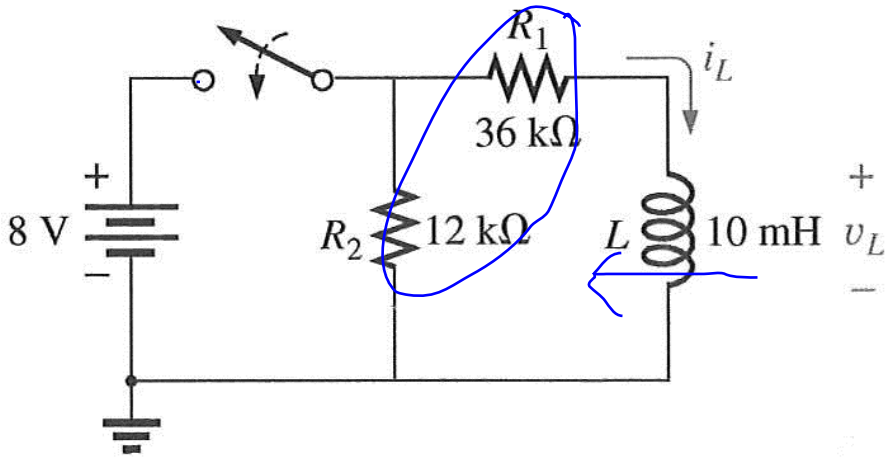
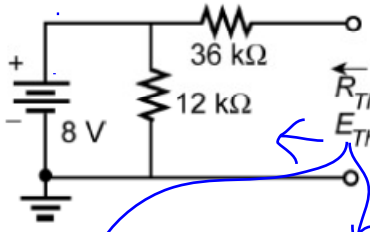


FIG. 85

a.



$R_{Th} = 36\ \text{k}\Omega$

$E_{Th} = 8\ \text{V}$

$$\tau = \frac{L}{R} = \frac{10\ \text{mH}}{36\ \text{k}\Omega} = 0.278\ \mu\text{s}$$

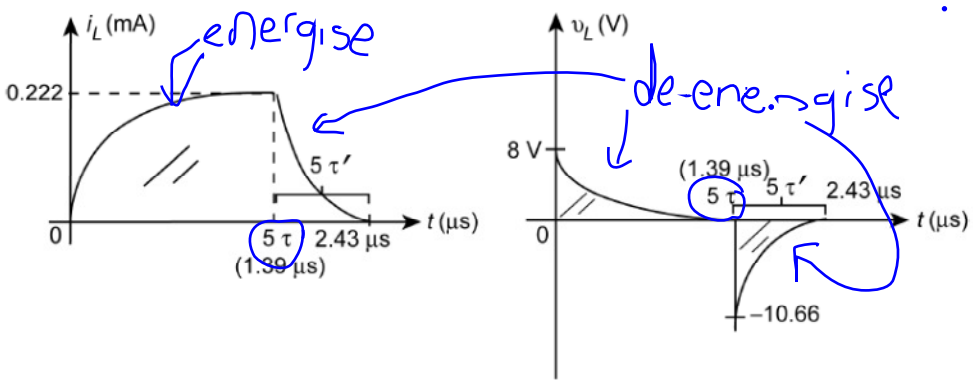
$$v_L = \mathbf{8\ V}e^{-t/0.278\mu\text{s}},\quad i_L = \frac{E}{R}(1 - e^{-t/\tau}) = \mathbf{0.222\ mA}(1 - e^{-t/0.278\mu\text{s}})$$

b. $5\tau \Rightarrow$ steady state

$$\tau' = \frac{L}{R} = \frac{10\ \text{mH}}{12\ \text{k}\Omega + 36\ \text{k}\Omega} = 0.208\ \mu\text{s}$$

$$i_L = I_m e^{-t/\tau'} = \mathbf{0.222\ mA}e^{-t/0.208\mu\text{s}}$$

$$v_L = -(0.222\ \text{mA})(48\ \text{k}\Omega)e^{-t/\tau} = \mathbf{-10.66V}e^{-t/0.208\mu\text{s}}$$



Question 2 [typical exam question]

a. $V_{peak} = (2.5 \text{ div.})(50 \text{ mV/div}) = \mathbf{125 \text{ mV}}$

b. $T = (3.2 \text{ div.})(10 \ \mu\text{s/div.}) = \mathbf{32 \ \mu\text{s}}$

c. $f = \dfrac{1}{T} = \dfrac{1}{32 \ \mu\text{s}} = \mathbf{31.25 \text{ kHz}}$

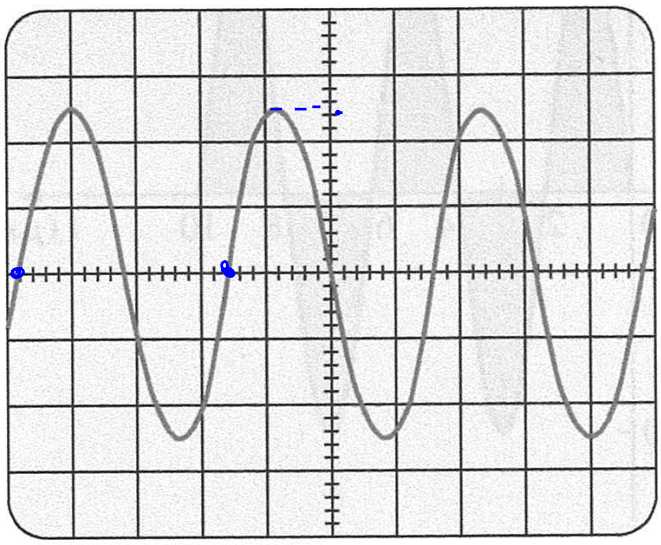
9. For the oscilloscope pattern of Fig. 84:

a. Determine the peak amplitude.

b. Find the period.

c. Calculate the frequency.

Redraw the oscilloscope pattern if a +20 mV dc level were added to the input waveform.

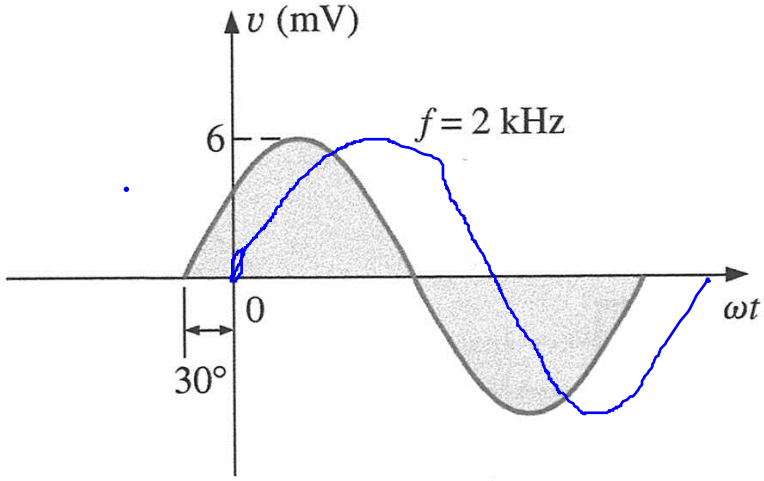


Vertical sensitivity = 50 mV/div.
Horizontal sensitivity = 10 μs/div.

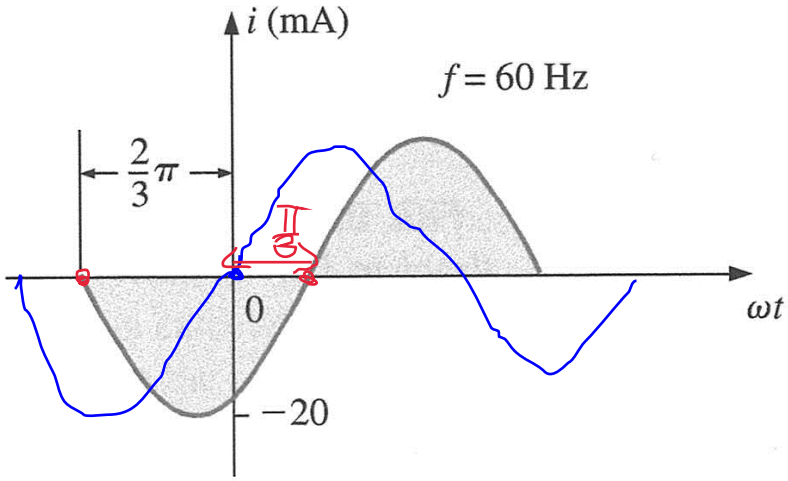
FIG. 84
Problem 9.

Question 3

27. Write the analytical expression for the waveforms of Fig. 85 with the phase angle in degrees.



(a)



(b)

FIG. 85
Problem 27.

27. a. $v = 6 \times 10^{-3} \sin(2\pi\, 2000t + 30°)$

b. $i = 20 \times 10^{-3} \sin(2\pi\, 60t - 60°)$

Question 4

Find the average value of the periodic waveform in Fig. 92.

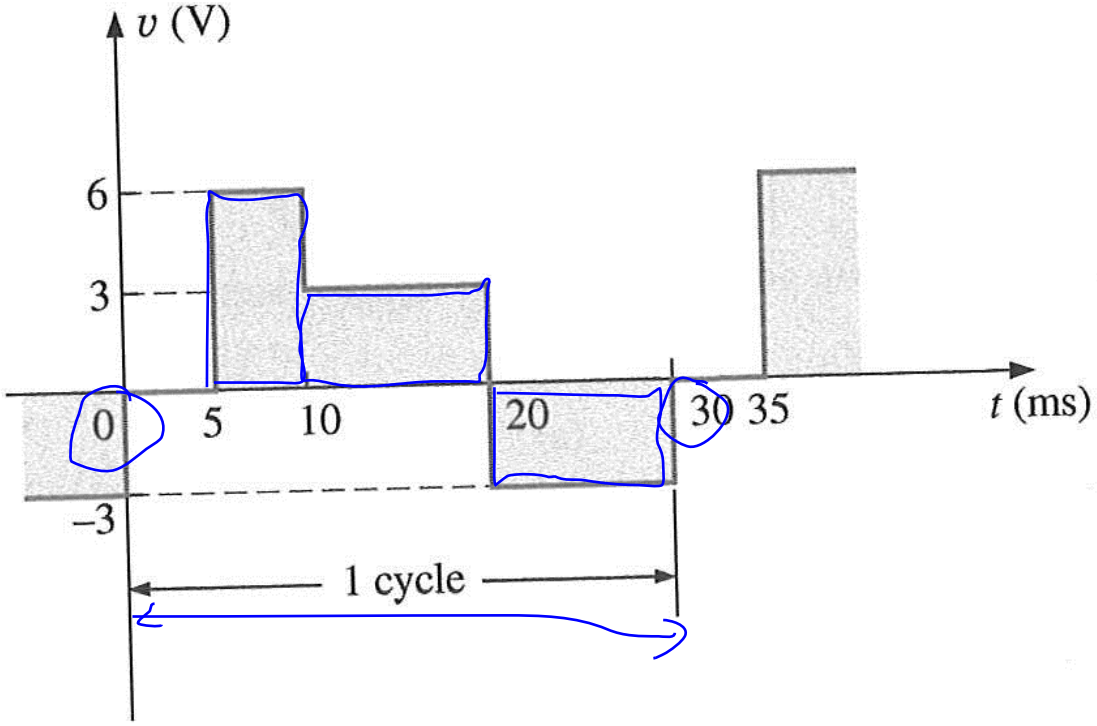


FIG. 92

$$G = \frac{0 + (6\text{ V})(5\text{ ms}) + (3\text{ V})(10\text{ ms}) - (3\text{ V})(10\text{ ms})}{30\text{ ms}}$$

$$= \frac{30\text{ V} + 30\text{ V} - 30\text{ V}}{30} = \mathbf{1\text{ V}}$$