



Sirindhorn International Institute of Technology
Thammasat University at Rangsit
School of Information, Computer and Communication Technology

ECS 303: Problem Set 10

Semester/Year: 2/2009

Course Title: Basic Electrical Engineering

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Course Web Site: <http://www.siit.tu.ac.th/prapun/ecs303/>

Due date: February 19, 2010 (Friday), 10:39 AM

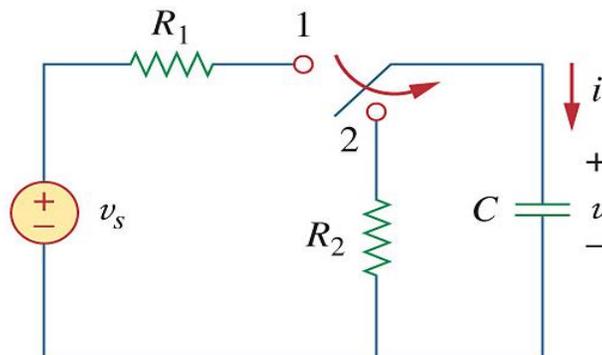
Instructions

1. ONE question will be graded. Of course, you do not know which problems will be selected; so you should work on all of them.
2. **Late submission will not be accepted.**
3. **Write down all the steps** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.

Part A:

1. Consider the circuit below. Let

$$V_s = 10 \text{ V}, R_1 = 30 \text{ k}\Omega, R_2 = 10 \text{ k}\Omega, \text{ and } C = 4 \text{ }\mu\text{F}.$$



Assume that the switch has been in position 1 during time $t < 0$. Then, during time $t \geq 0$ the switch changes its position five times: at $t_1 = 0$ ms, $t_2 = 25$ ms, $t_3 = 50$ ms, $t_4 = 75$ ms, $t_5 = 100$ ms.

(At time t_1 , the switch changes to position 2. At time t_2 , the switch changes back to position 1. At time t_3 , the switch changes again to position 2....)

Plot the voltage $v(t)$ for time $t > 0$.

Hint: You should have $v(t_5) \approx 4.59$ V.

2. A current source in a linear circuit has

$$i_s = 8\cos(500\pi t - 25^\circ) \text{ A}$$

- What is the amplitude of the current?
- What is the angular frequency?
- Find the frequency of the current.
- Calculate i_s at $t = 2$ ms.

3. Find the phasors (in polar form) corresponding to the following signals. Simplify your answer as much as you can.

- $v(t) = 21 \cos(4t - 15^\circ)$ V
- $i(t) = -8 \sin(10t + 70^\circ)$ mA
- $v(t) = 120 \sin(10t - 50^\circ)$ V
- $i(t) = -60 \cos(30t + 10^\circ)$ mA
- $x(t) = -10 \cos(4t + 75^\circ)$
- $x(t) = 5 \sin(20t - 10^\circ)$
- $x(t) = 4 \cos 2t + 3 \sin 2t$

4. Consider the signal $x(t)$ below. Suppose $x(0) = -3.356$. Find its phasor.

