Seat No.: _____

King Mongkut's University of Technology Thonburi
Midterm Exam of Second Semester, Academic Year 2007

CPE 223 Circuit and Electronics for Computer Engineers **CPE(Inter.), 2nd Yr.**

Wednesday 19 December 2007 **13.00-16.00 h.**

Instructions

1. This examination contains 8 problems, 3 pages (including this cover page).
2. The answers must be written in the answer book.
3. Students are allowed to use **calculator**.
4. **Books**, **notes**, and **dictionary** are **NOT** allowed.

Students must raise their hand to inform to the proctor upon their completion of the examination, to ask for permission to leave the examination room.
Students must not take the examination and the answers out of the examination room.

Students will be punished if they violate any examination rules. The highest punishment is dismissal.

This examination is prepared by

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This examination paper is approved by Computer Engineering Department.

Student Name: _____ I.D.: _____

1. Find the average and *rms* values of the signal in Figure 1. (4 points)

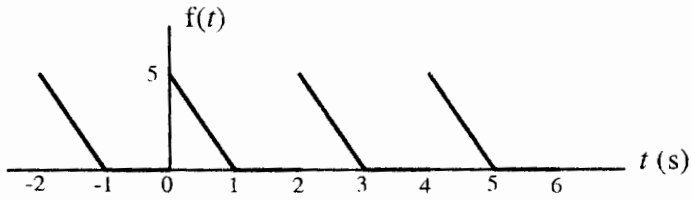

Figure 1

2. The current $i(t)$ flowing through a 1-μF capacitor is shown in Figure 2. Assume that $v(0) = 2$ V.
   (a) Find $v(0.5\text{ms})$
   (b) Find $v(1.5\text{ms})$
   (c) Find t such that $v(t) = 30$ V (6 points)

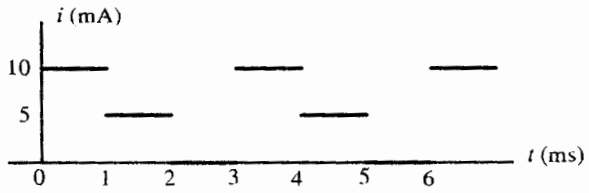

Figure 2

3. Using the diode approximation model shown to the right of Figure 3, find v_o. (4 points)

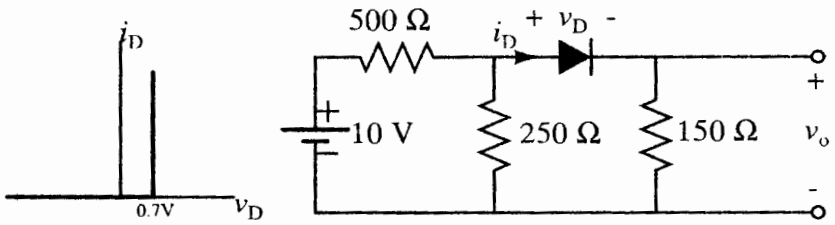

Figure 3

4. Use nodal analysis to determine all node voltages (4 points)

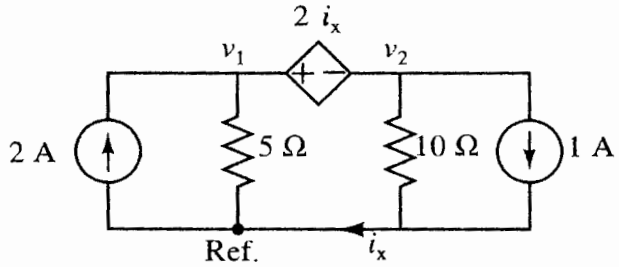

Figure 4

5. Use either nodal or mesh analysis to determine the voltage v_x, current i_y, and power generated by the 10-V voltage source. (6 points)

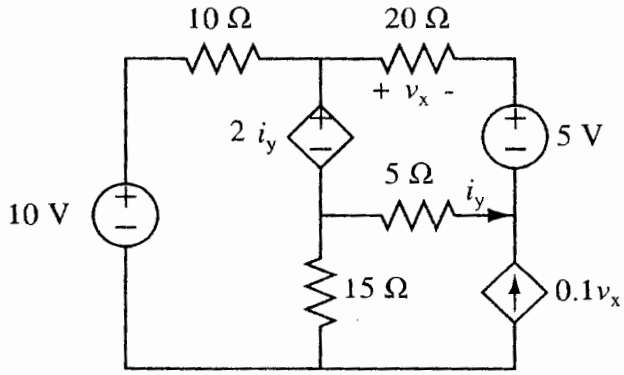

Figure 5

6. For the circuit in Figure 6, what resistor connected across terminals *a-b* will absorb maximum power from the circuit? What is that power? (4 points)

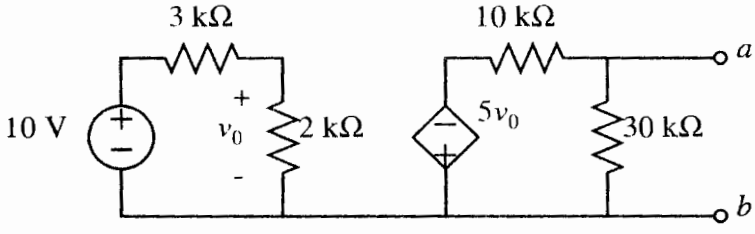

Figure 6

7. Find $i(t)$ for t > 0 in Figure 7 if $i(0) = 2$ A. (6 points)

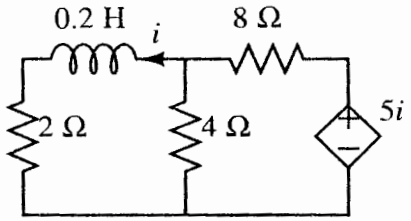

Figure 7

8. The switch in Figure 8 has been closed for a very long time. At $t = 0$, the switch is opened.
   (a) Find $i_L(0^-)$ and $v_C(0^-)$.
   (b) Find $i_L(t)$ and $v_C(t)$ for $t \geq 0$. (6 points)

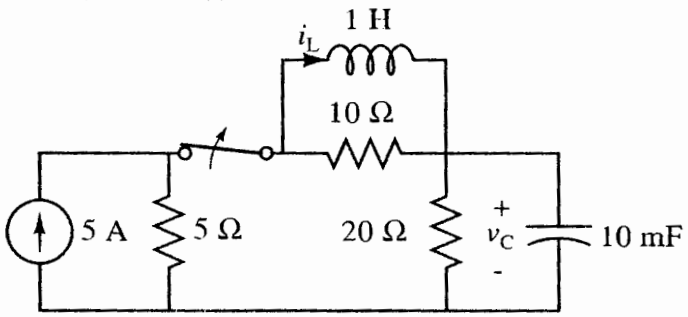

Figure 8

Supplemental

$$\overline{f(t)} = \frac{1}{T}\int_0^T f(t)dt$$

$$\langle f(t)\rangle^2 = \frac{1}{T}\int_0^T f^2(t)dt$$

$$i_C = C\frac{dv}{dt}$$

$$v_C = \frac{1}{C}\int_{t_0}^{t} i(t)dt + v_C(t_0)$$

$$v_L = L\frac{di}{dt}$$

$$i_L = \frac{1}{L}\int_{t_0}^{t} v(t)dt + i_L(t_0)$$

Source-free RC: $\tau = RC$, $\quad v_C(t) = V_0 e^{-t/\tau}$
Source-free RL: $\tau = L/R$, $\quad i_L(t) = I_0 e^{-t/\tau}$