ECE1050/60 Exam 1 given: Fall 03

(The space between problems has been removed.)

Remember, to get the most possible partial credit, always show all the intermediate values that you can calculate. If further calculations depend on a value that you can’t figure out, just use a letter (like $I_{R_1}$) or a guessed value and proceed.

1. (24 pts) In the circuit shown we measure the voltage across $R_4$ as 2.0 V. The power dissipated by $R_1$ is 9.8 mW.
   a) What must $V_S$ be?
   
   ![Circuit Diagram](image)
   
   Note: feel free to show answers & work right on the schematic
   
   b) What is the value of $R_1$?
   
   c) How much power does $R_4$ dissipate?

2. (18 pts) Use the method of superposition to find the current $I_2$ (through $R_2$). Be sure to clearly show and circle your intermediate results.

   ![Circuit Diagram](image)

3. (18 pts)
   a) Find and draw the Thévenin equivalent of the circuit shown. The load resistor is $R_L$.
   
   ![Circuit Diagram](image)
   
   b) Find and draw the Norton equivalent of the same circuit.
   
   ![Circuit Diagram](image)
   
   c) Use the Norton equivalent circuit to find the current through the load.

   $I_{RL} =$ ?

4. (16 pts) Use nodal analysis to find $V_a$.

   ![Circuit Diagram](image)
5. (19 pts) For the waveform shown, find:
   a) peak-to-peak voltage, $V_{pp}$
   b) amplitude, A
   c) period, T
   d) frequency $f$ in cycles/sec or Hz
   e) frequency $\omega$ in radians/sec
   f) the phase angle in degrees
   g) a complete expression for $v(t)$, include numbers and units

6. (5 pts) The question below is similar to what you might see on the FE exam. They expect you to average about 2 minutes per question.
   a) The voltage across the 50-ohm resistor in the circuit shown is most nearly:

   (A) 0.95 V 
   (B) 2.4 V 
   (C) 5.95 V 
   (D) 8.33 V 
   (E) 14.3 V 

   **Answers**
   1. a) 6.7 V  b) 50 Ω  c) 8 mW
   2. $I_{2vS} = 20 \text{ mA}$  $I_{2ls} = -6 \text{ mA}$  $I_2 = 14 \text{ mA}$
   3. a)  
   4. -2.4 V
   5. a) 10 V  b) 5 V  c) 80 μs  d) 12.5 kHz  e) 78.5 rad sec
   f) -90 deg  g) $5 \cdot V \cdot \cos \left( \frac{78540 \text{ rad sec}}{\sec} t - 90 \text{ deg} \right) + 3 \cdot V$ 
   6. B