NAME/NUMBER:_____

BOĞAZİÇİ UNIVERSITY

FALL, 2006

ELECTRICAL AND ELECTRONICS ENGINEERING

EE 210 Introduction to Electrical Engineering
Instructor: Asst. Prof. Arda D. Yalçınkaya

Midterm # 1

(Time allowed: TWO hours)

NOTES:

- ▷ There are six questions, totaling 100 points. Answer **All** questions. The credit for each problem is given to help you allocate your time accordingly. Do not spend all your time on one problem.
- ▷ You must show your work (in the space provided plus the back of the pages) for all problems to receive full credit; simply providing answers will result in only partial credit, even if the answers are correct. If you require extra space beyond what is provided, be sure to turn in any material that is required to support your solutions.
- ▷ *Put your name on any additional material that you submit.*
- ▷ Be sure to provide units where necessary.

Grading

Question 1	/10 points
Question 2	/10 points
Question 3	/20 points
Question 4	/20 points
Question 5	/20 points
Question 6	/20 points
Total	/100 points

1. (a) An ultrawide band (UWB) circuit uses an operation frequency of 9 GHz. Calculate the upper limit of the circuit size where lumped circuit theory still holds ($c = 3 \times 10^8$ m/s).
(3 points)

(b) Voltage-current relationship for the two-terminal given in Fig.P1 is

$$v = 0 \quad \text{for} \quad t \leq 0 \quad \text{and} \quad v = 30te^{-20t} \text{ mV} \quad \text{for} \quad t \geq 0$$
$$i = 0 \quad \text{for} \quad t \leq 0 \quad \text{and} \quad i = 5te^{-20t} \ \mu\text{A} \quad \text{for} \quad t \geq 0$$

Calculate (i) the maximum value of the power (ii) the total energy delivered to the circuit element.
(7 points)

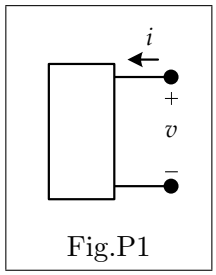

Fig.P1

2. Fig.P2 shows a valid electrical network. Calculate the total absorbed power, the voltage of element 6 and the total developed power.
(10 points)

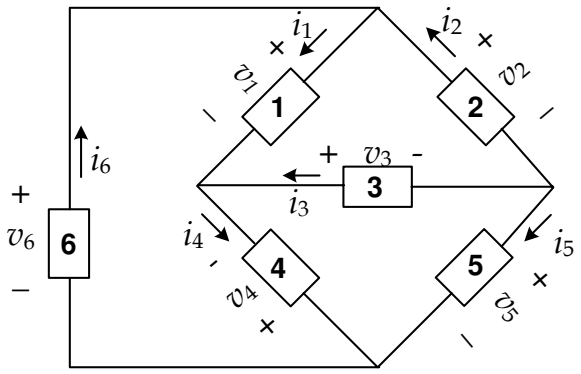

Fig.P2

Element	Voltage [V]	Current [A]
1	4	8
2	3	−7
3	−1	3
4	−4	11
5	5	4
6	?	15

3. For the circuit given in Fig.P3, calculate

(a) the equivalent resistance seen by the voltage source (R_{eq}) **(8 points)**

(b) the value of $v_{6\Omega}$. **(12 points)**

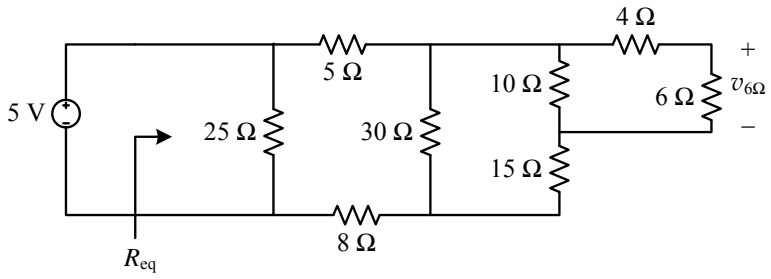

Fig.P3

4. For the circuit shown in Fig.P4, find (a) i_1, (b) v, (c) i_2, and (d) the power supplied by the current source.
(20 points)

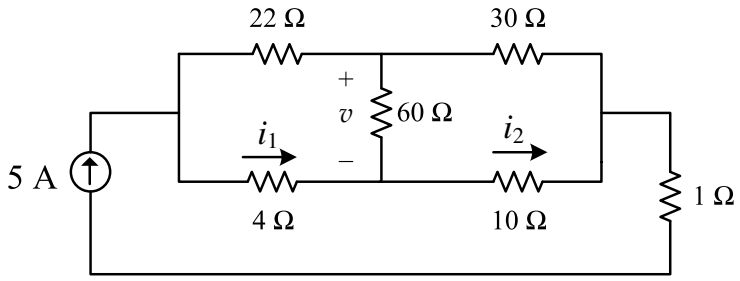

Fig.P4

5. (a) Find v_0 in the circuit given in Fig P.5(a). **(10 points)**

(b) Find i_g and i_0 in the circuit given in Fig P.5(b). **(10 points)**

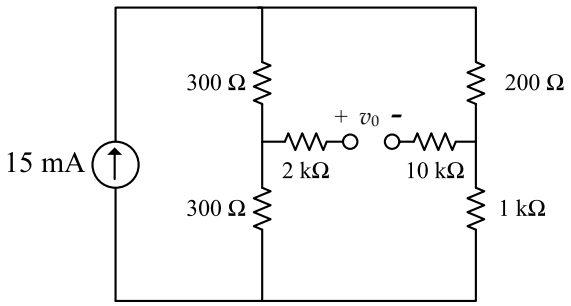

Fig.P5(a)

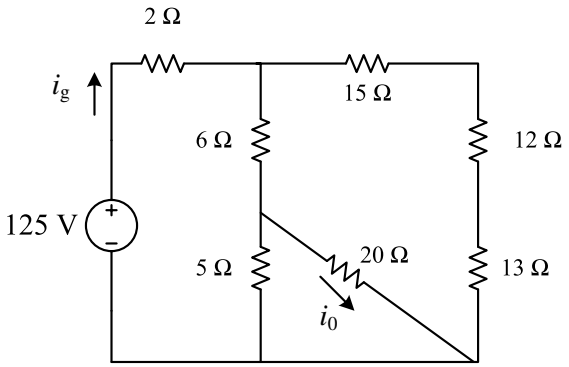

Fig.P5(b)

6. For the circuit given in Fig.P5, $v_s = 5$ V, $R = 1$ kΩ and $g = \frac{1}{10}$ m℧. Calculate the value of v_2. **(20 points)**

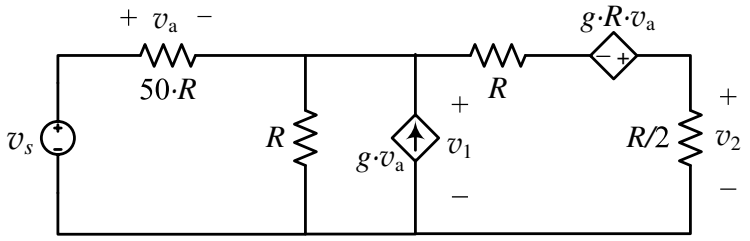

Fig.P5