Minia University
CSE Dept.
Electric circuits analysis

Midterm Exam 2, Time allowed: 1.5 Hrs
Name:_____
Date:_____

- *This is a closed book exam.*
- *Exam questions in two pages, answer all of them.*
- *Good Luck!*

1. (a) Use a series of source transformation to find i_0 in the circuit in Figure 1,
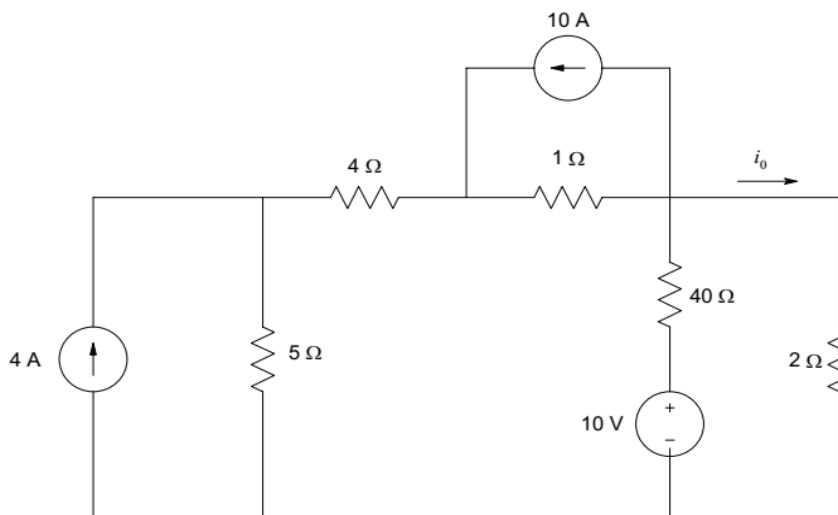   (b) Verify your solution by using the mesh analysis method. *[10 marks]*

Figure 1

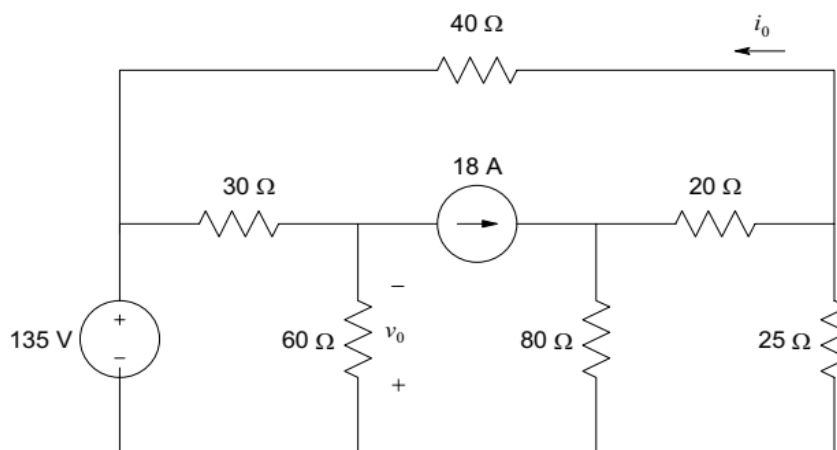**2.** Use superposition theorem to find i_0 and v_0 in the circuit shown in Figure 2.
[10 marks]

Figure 2

3. Find the node voltages V_1, V_2, and V_3 for the circuit in Figure 3 using nodal
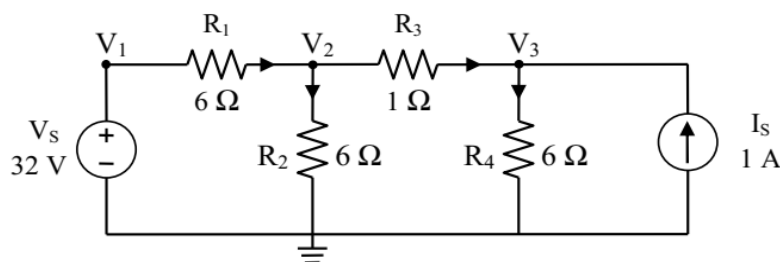analysis. *[10 marks]*

Figure 3

4. For the circuit shown in Figure 4, determine: [10 marks]

(a) $i_R(0^+)$, $i_L(0^+)$, and $i_C(0^+)$,

(b) $di_R(0^+)/dt$, $di_L(0^+)/dt$, and $di_C(0^+)/dt$,

(c) $i_R(\infty)$, $i_L(\infty)$, and $i_C(\infty)$.

Figure 4
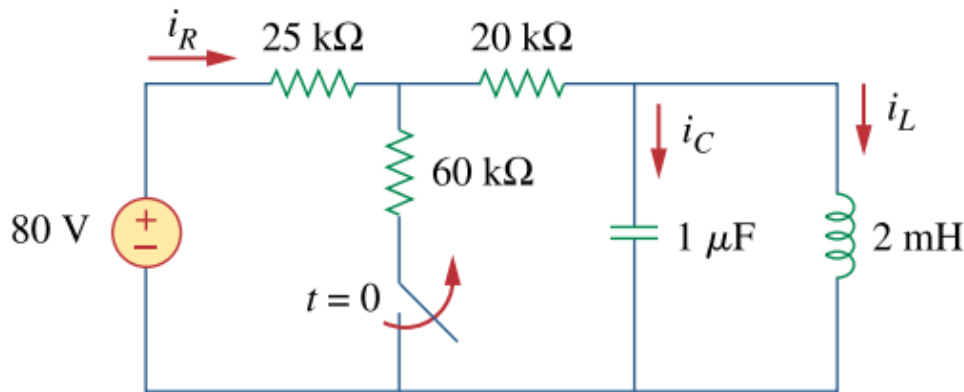
5. True or false: [10 marks]

i. Three capacitors 1.2 µF, 2.2 µF 4.6 µF are connected in series. The total capacitance is equal to 8 µF.

ii. An inductor, a resistor, and a switch are connected in series to a 12 V battery. At the instant the switch is closed, the inductor voltage is 0 V.

iii. A capacitor is composed of two parallel conducting plates separated by an insulating material called the dielectric.

iv. When two capacitors are in parallel with a voltage source, the smaller capacitor will have the larger voltage.

v. Ideally, an inductor appears as a short to dc.

vi. A rheostat performs the same function as a potentiometer.

vii. The total current entering a node is always equal to the total current leaving the node.

viii. The Norton current is equal to the current through the shorted output terminals of a circuit.

ix. Resistors are used to decrease the voltage in a circuit.

x. ModelSim is a software to simulate both DC and AC electric circuits.