Mansoura University
Faculty of Engineering

Electric Circuits
Course Code: ECE 161
Fall Semester Exam.

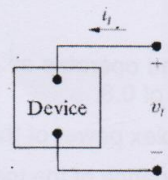
Biomedical Engineering Program
Level 100
Exam Date: 17-1- 2015
Allowed Time: 2 Hours

Attempt all questions. Assume any missed data. Full mark is 50

Q.1.a) The terminal voltage and terminal current were measured on the device shown and the values of v_t and i_t are tabulated.

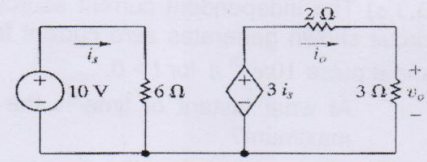
i. Construct a circuit model of the device

ii. Predict the power this device will deliver to a 10Ω resistor. **[7 Marks]**

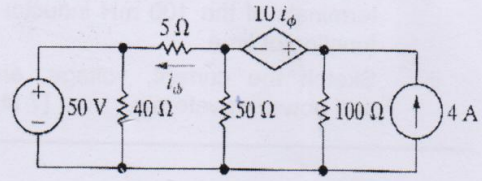


v_t (V)	i_t (A)
100	0
180	4
260	8
340	12
420	16

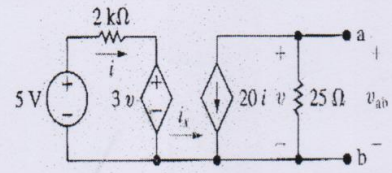
Q.1.b) Use Kirchhoff's laws and Ohm's law to find the voltage v_o as shown in figure. Show that your solution is consistent with the constraint that the total power developed in the circuit equals the total power dissipated. **[7 Marks]**



Q.1.c) Find the current i_ϕ in the circuit shown. Find the power dissipated in the 100Ω resistor. Find the power developed by the 4A current source. **[7 Marks]**



Q.2.a) If a 8KΩ resistor is connected between terminals a & b, use Thevenin equivalent to find the power dissipated in this resistor. **[7 Marks]**

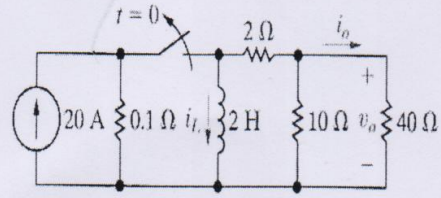


Q.2.b) The switch in the circuit shown has been closed for a long time before it is opened at *t=0*. Find

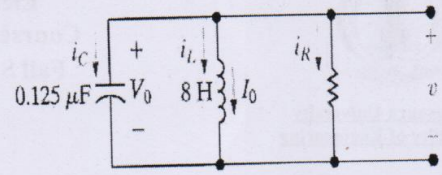
i. $i_L(t)$ *for* $t \geq 0$

ii. $i_o(t)$ *for* $t \geq 0$

iii. $v_o(t)$ *for* $t \geq 0$ **[7 Marks]**



Q.2.c) For the circuit shown, $V_o = 0$, $I_o = -12.25mA$.

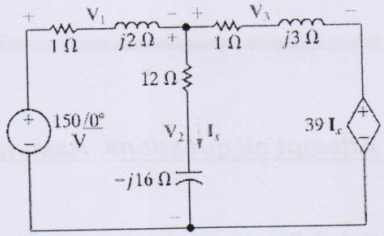


i. Find the value of R that results in a critically damped voltage response.

ii. Calculate v(t) for $t \geq 0$

iii. Plot v(t) versus t for $0 \leq t \leq 7ms$ **[7 Marks]**

Q.3.a) Use mesh current method to find the values of V_1, V_2, *and* V_3 in the circuit shown in figure. **[7 Marks]**

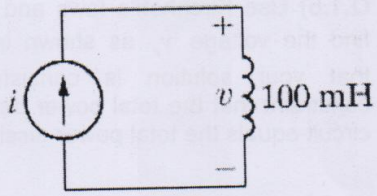


Q.3.b) An electrical load operates at 240V rms. The load absorbs an average power of 8KW at a lagging power factor of 0.8.

i. Calculate the complex power of the load.

ii. Calculate the impedance of the load. **[7 Marks]**

Q.3.c) The independent current source in the circuit shown generates *zero* current for *t < 0* and a pulse $10te^{-5t}A$ for *t > 0*.



i. At what instant of time is the current maximum?

ii. Express the voltage across the terminals of the 100 mH inductor as a function of time.

iii. Sketch the current, voltage, energy, and power waveforms. **[7 Marks]**

My best wishes to all of you!

Assis. Prof. Hossam El-Din Moustafa