UNIVERSITY OF JORDAN
FACULTY of ENGINEERING & TECH.
ELECTRICAL ENGINEERING DEPT.

EE 211 **2^{nd} Exam**
4-12-2013 **75 min**

29/30

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Instructor:

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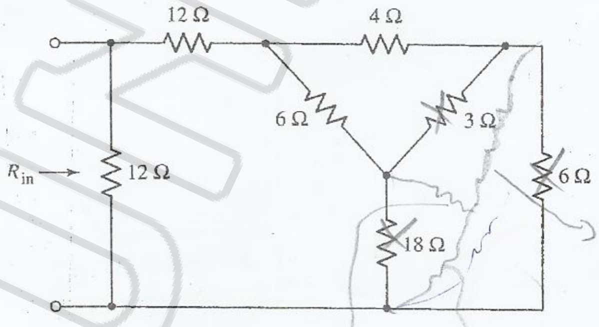
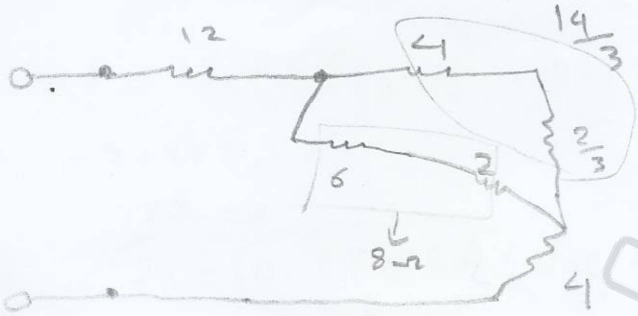
Q1) (4 marks) *Determine R_{in} in the following circuit.*

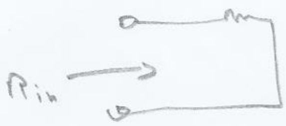


$\frac{(6)(3)}{6+3+18} = \frac{2}{3}\ \Omega$

$\frac{(3)(18)}{27} = 2\ \Omega$

$\frac{(6)(18)}{27} = 4\ \Omega$

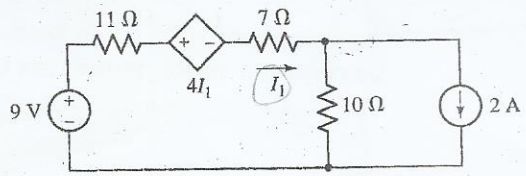




$= \frac{360}{19} = 18.947\ \Omega$

3

(6 marks) *Use **superposition** principle to find I_1 in the following circuit. **Show** all your work's details.*



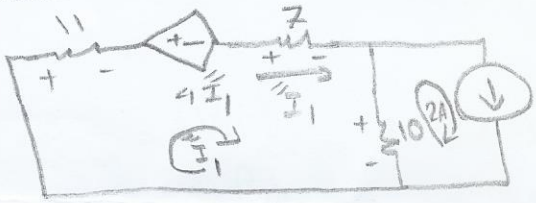
$$-9 + 11\acute{I}_1 + 4\acute{I}_1 + 7\acute{I}_1 + 10\acute{I}_1 = 0$$

$$-9 + 32\acute{I}_1 = 0$$

$$32\acute{I}_1 = 9$$

$$\acute{I}_1 = 0.28125\ A \text{ due to } \boxed{9\text{ V-source}}$$

6



$$11\acute{\acute{I}}_1 + 4\acute{\acute{I}}_1 + 7\acute{\acute{I}}_1 + 10(\acute{\acute{I}}_1 - 2) = 0$$

$$32\acute{\acute{I}}_1 - 20 = 0$$

$$\acute{\acute{I}}_1 = \frac{20}{32} = \frac{5}{8} = 0.625\ A \text{ due to } \boxed{2\text{A-source}}$$

$$\therefore I_1 = \acute{I}_1 + \acute{\acute{I}}_1 = 0.28125 + 0.625 = \frac{29}{32} = 0.90625\ A$$

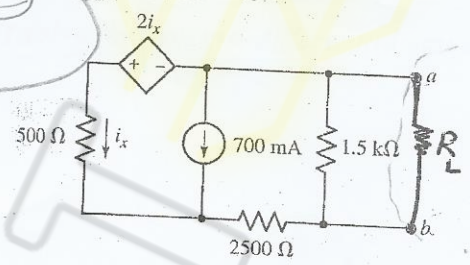
) (7 marks) *For the following circuit:*

a) *Find V_{TH} seen by the load R_L.*

b) *Find I_N seen by the load R_L*

c) *Determine R_L to get maximum power transferred.*

d) *Calculate P_{Lmax}*



a) $V_{TH} = V_{oc} = -116.25$ V

b) $I_N = \frac{V_{th}}{R_{th}}$

$= -0.116278$ A

c) $R_L = R_{th} = \frac{V_{th}}{i_{sc}} = 999.759\ \Omega$

d) $P_{Lmax} = \frac{(V_{th})^2}{4R_{th}} = 3.37933$ watt

$500(-ix) + 2ix + (1.5)10^3 i_2 = 0$

$2500 i_2 = 0$

$(-ix - i_2) = 700\,10^{-3}$

$ix + i_2 = -0.7$

$ix = \frac{-1400}{2249} = -0.6225$ A

$i_2 = \frac{-1743}{22490} = -0.0775$ A

$V_{oc} = (1.5)(10^3)(-0.0775)$

$V_{oc} = \frac{-465}{4} = -116.25$ V

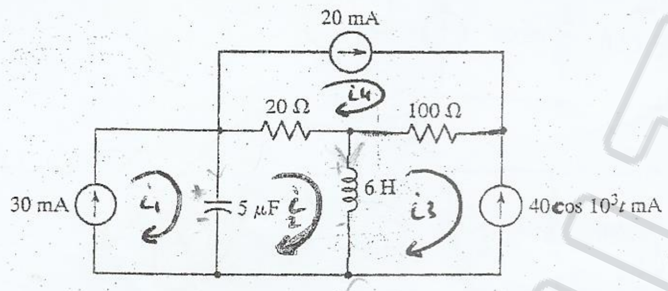
Same symbols does not necessarily represent the same thing in this box

$500(-ix) + 2ix + 2500 i_{sc} = 0$

$-ix - i_{sc} = 0.7$

$ix = \frac{-875}{1499} = -0.5837$ A

) (4 marks) *Write mesh equations for the following circuit. (Don't solve the integro-differential equation)*



? أحد مصطلحات

$i_1 = 30 \, 10^{-3}$ A

$v = 6 \frac{d(i_2 - i_3)}{dt}$

? هل أفهمها

$i = c \frac{dv}{dt}$

$V = \frac{1}{c} \int_{t_0}^{t} i \, dt + V_0$; $c = 5 \, 10^{-6}$; $i = (i_1 - i_2)$

$-\frac{1}{c} \int_{t_0}^{t} (i_1 - i_2) dt - V_0 + 20(i_2 - i_4) + 6 \frac{d(i_2 - i_3)}{dt} = 0$

$-\left(\frac{10^6}{5} \int_{t_0}^{t} (30 \, 10^{-3} - i_2) dt + V_0\right) + 20(i_2 - i_4) + 6 \frac{d(i_2 - i_3)}{dt} = 0$ ---- (1)

~~$-\left(6 \frac{d(i_2 - i_3)}{dt}\right) + 100(i_3 - i_4)$~~

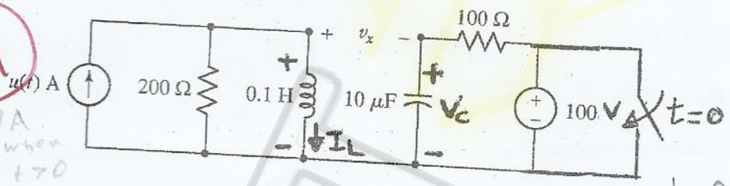
$i_3 = -40(\cos 10^3 t) 10^{-3}$ A

$i_4 = 20 \, 10^{-3}$ A

$-\left(\frac{10^6}{5} \int_{t_0}^{t} (30 \, 10^{-3} - i_2) dt + V_0\right) + 20(i_2 - 20 \, 10^{-3}) + 6 \frac{d(i_2 + 40 \cos 10^3 t \, (10^{-3}))}{dt} = 0$

4

3) (9 marks) For the following circuit, find:



a) $V_C(0^-)$ $= 100\ V$

b) $I_L(0^-)$ and $I_L(0^+)$

$I_L(0^-) = I_L(0^+) = 0$

c) $I_L(\infty)$ $= 1\ A$

d) τ of the RL circuit and τ for the RC circuit

$\tau = \frac{L_{eq}}{R_{eq}} = \frac{0.1}{200} = 5 \times 10^{-4}\ s$

$\tau = R_{eq} C_{eq} = (100)(10 \times 10^{-6}) = 10^{-3}\ s$

e) $V_L(t)$ for t>0

$V_L(0^+) = V_{200}(0^+) = (1)(200) = 200\ V$

$V_L(\infty) = 0$

$V_L(t) = 0 + A e^{-t/\frac{0.1}{200}}$

$V_L(t) = A e^{-t/5 \times 10^{-4}}$

$\Rightarrow 200 = A e^0$

$\therefore A = 200$

$\therefore V_L(t) = 200 e^{-t/5 \times 10^{-4}}$

f) $V_C(t)$ for t>0

$V_C(t) = 100 e^{-t/10^{-3}}$

g) $v_x(t)$ for t>0

$v_x(t) = V_L(t) - V_C(t) = 200 e^{-t/5 \times 10^{-4}} - 100 e^{-t/10^{-3}}$

Good luck