

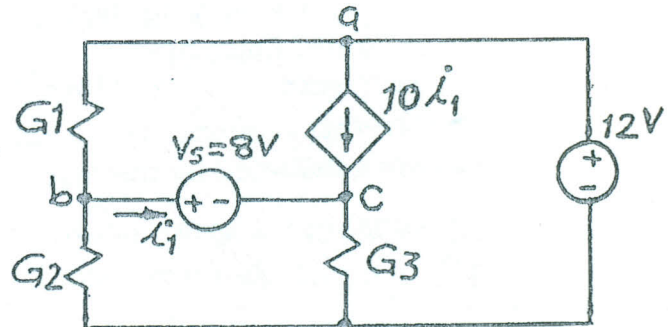
Mansoura University	Electrical Eng. Dept.
Faculty of Engineering	1 st Year, January 2013
PART (A) : 90 Minutes	Electric Circuits(1)

Please Answer all questions ;(Don't use pencil)

First Question : (12 Marks):

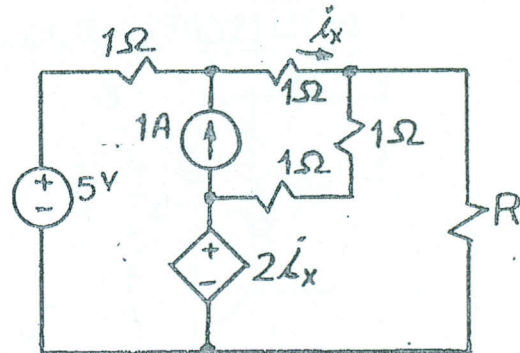
Using nodal-voltage analysis method, determine the current " i_1 " passing through the 8-V voltage source for the shown circuit.

$$G_1 = G_2 = G_3 = 0.5 \text{ S}$$



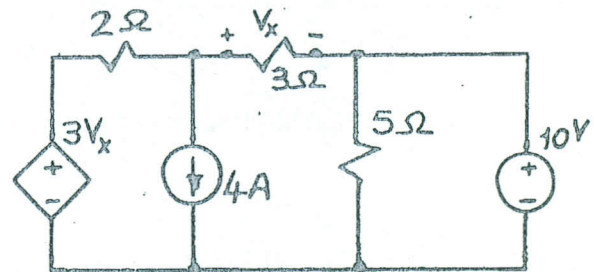
Second Question: (12 Marks):

For the shown circuit, determine the value of resistor "R" that consumes maximum power.



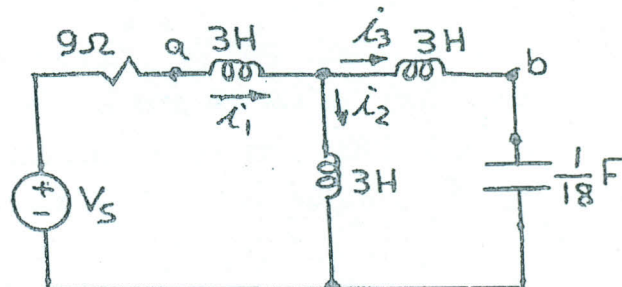
Third Question: (12 Marks):

Using the superposition theorem, determine the value of voltage V_x for the shown circuit.



Fourth Question: (12 Marks):

For the shown AC. Circuit, if $V_s = 36 \sin(3t - 60^\circ) \text{ V}$, determine i_1 , i_2 , i_3 and V_{ab} . Also determine the circuit impedance, power factor, and the power consumed by this circuit.



Please turn over

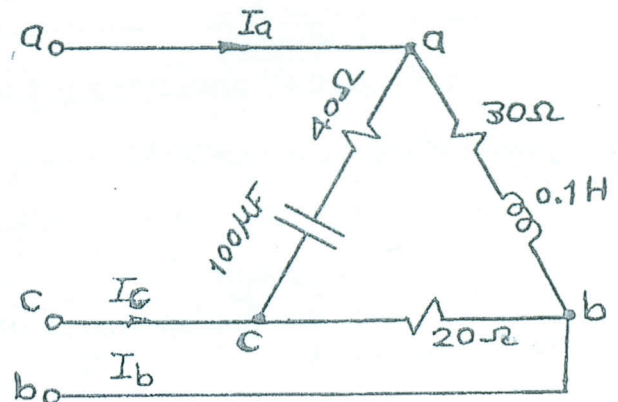
Fifth Question: (12 Marks):

A 3-ph supply with voltage of $V_s = 380 \sin 314t$ V, is supplying the 3-ph load shown in figure. Calculate;

a- The phase currents.

b- The line currents.

The total power consumed by the load.



WITH MY BEST WISHES

Prof. Dr. Kamal Shebl

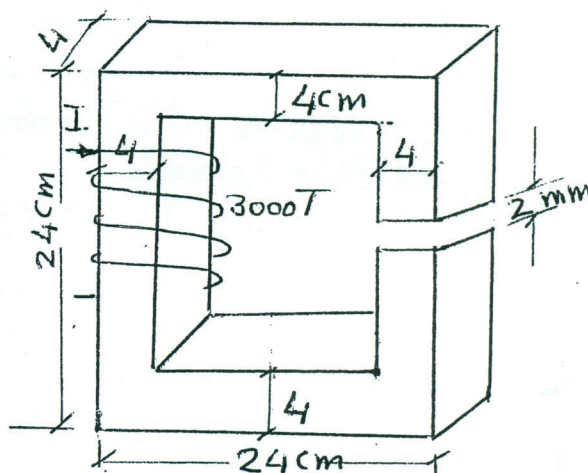
Part II

ممنوع استخدام القلم الرصاص في الإجابة

Q₁:

- a) **Derive** the equation for energy stored in an air-gap and the equation for force between two magnetic surfaces.
- b) **Sketch** typical hysteresis loop for:
i) soft iron ii) Hard iron iii) Ferrite
and **explain** the origin of eddy currents in a magnetic core.
- c) A cast iron ring has a 3600 turns coil which carry a current of 0.2 A. The cross-sectional area of the ring is 5 Cm², and magnetic path length is 25 Cm. **Determine** the total flux.

- d) In the magnetic circuit shown.
Calculate the current I. ($\mu_r = 2000$)

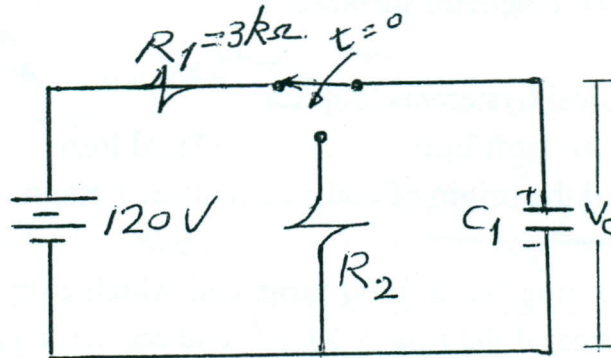


Q₂:

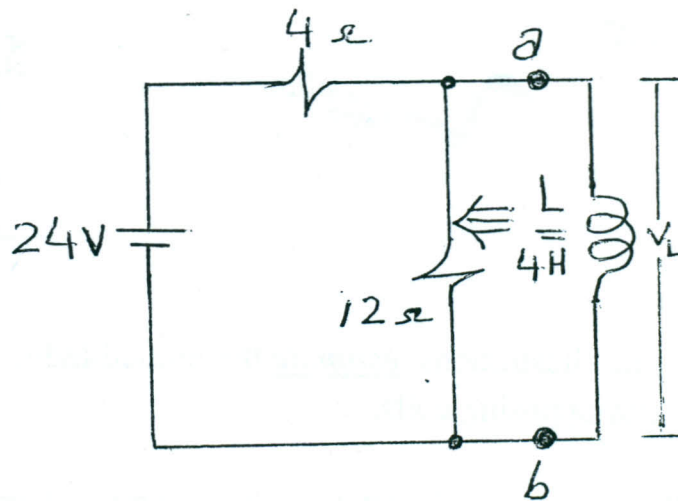
- a) Using illustrations, **estimate** the mutual inductance between two series-aiding and series-opposing coils.
- b) **Demonstrate** and **sketch** the basic circuit of an automobile ignition coil and how it operates.
- c) Two identical coils have a relative permeability of 500. Each coil has 100 turns and the core dimensions are: cross sectional area $A = 3 \text{ Cm}^2$, and magnetic path length $\ell = 20 \text{ Cm}$. **Calculate** the inductance of each coil and the mutual inductance between the coils. (Assume the two coils are wound on the same core).
- d) The total inductances of two coils when they are connected in series-aiding and series-opposing are $1.2 \times 10^{-3} \text{ H}$ and $0.6 \times 10^{-3} \text{ H}$ respectively, **calculate** L_1 , L_2 , and M .

Q3:

- a) A C-R circuit connected as shown in Fig (). If C_1 is to be charged to 60 V in 24 ms, determine the value of C_1 . Also, calculate the value of R_2 for $I_0 = 1.2$ mA in the discharge cycle.



- b) Determine V_{th} and R_{th} between the terminals a, b. Use V_{th} , R_{th} in determining i and v_L after 2 seconds.



Good Luck. Prof. Mohamed Adel El-sayes.