Benha University
Faculty of Engineering at Shoubra
Electrical Engineering Department
1st Year Communications

Final Term Exam
Date: Tuesday 24/5/2016
Subject: Test (1)
Duration: 2 hours

- **Answer all the following questions**
- **Illustrate your answers with sketches when necessary**

- **No. of questions : 2 (In part I)**
- **Total Mark: 50 Marks**

Part I [25 Marks]

Question (1)[12 marks]

A. Explain how you can calculate***[4 marks]***:

- Capacitors in parallel and series.

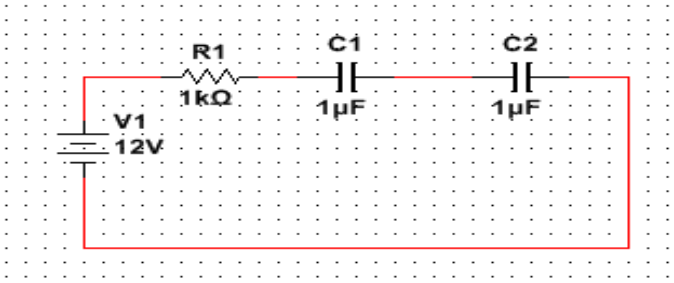
  $Cs = (1/C1 + 1/C2 + \dots)^{-1}$
  $Cp = (C1 + C2 + \dots)$

- Inductors in parallel and series.

  $Lp = (1/L1 + 1/L2 + \dots)^{-1}$
  $Ls = (L1 + L2 + \dots)$

B. For the following figure find: ***[8 marks]***.

- The equivalent capacitance.
- The time constant.



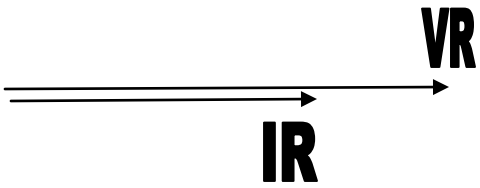
Ceq = C1*C2 / C1+C2
= 0.5 UF

Time Constant = Ceq * R= 1K *0.5 UF = 0.5 m Sec

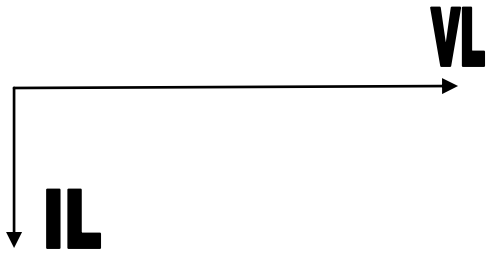
Question (2)[13 marks]

A. Explain the relation between I and V for ***[6 marks]***:

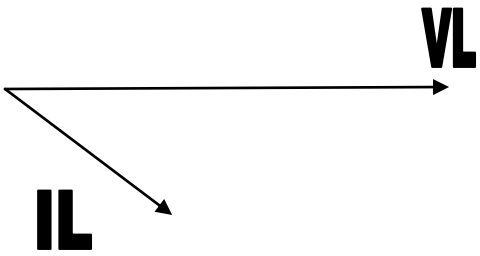
- Pure R.



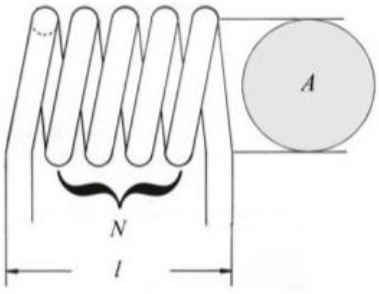
- Pure L.



- R and L.



B. Explain how you can compute the inductance of the coil shown below. ***[7 marks]***

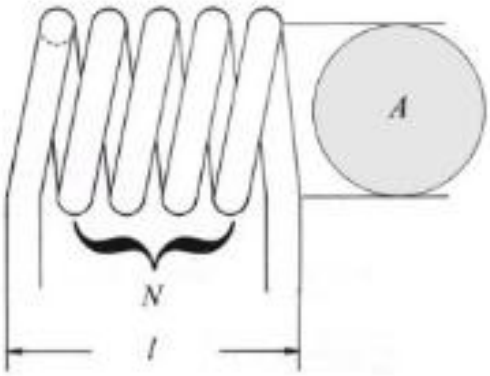


Answer

Winding a conductor into successive loops results in a coil through which magnetic field lines pass when the coil conducts a current. The magnetic field's intensity is characterized by the magnetic flux. Changes in the magnetic flux through the coil (due to changes in amperage, for example) give rise to a *self-induced voltage* in the coil; this voltage's value depends on the current's rate of change, and on the coil's size and nature. The coil's inductance *L* is a measure of its ability to generate self-induced voltages. The following relationship applies to an elongated coil:

$$L = \mu_0 \cdot \mu_r \cdot \frac{N^2}{l} \cdot A$$

μ_0 is the magnetic field constant, μ_r the coil core's relative permeability, *N* the number of windings, *l* the coil's length, and *A* the coil's cross-section (see the diagram below).



The unit of inductance is the *Henry* (symbol H, 1 H = 1 Vs/A). A coil has an inductance of 1 H if a uniform change of 1 A per second in the coil current induces a voltage of 1 V.

GOOD LUCK

DR .MICHAEL NASIEF