lansoura University
iculty of Engineering
ept. of Electrical Engineering

1st Grade Elec. Eng.
Electrical Measurements
Time: Three Hours

Final Term Exam June 2011

nswer the following Questions   Total Marks= 60
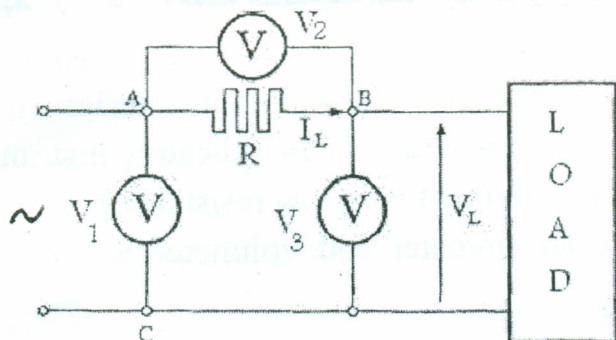
First Question (10 Marks)

-a) **Explain** with the help of neat sketch the components of a generalized model of any instrument. **Clarify** the function of each component in the instrumentation process   (5 marks)

·b) **Explain** FIVE ONLY of the following terms:
"calibration", "interfering inputs", "random errors", "passive sensors", "accuracy", "damping torque", and "sensor fusion"   (5 marks)

Second Question (10 Marks)

·a) **Explain** briefly the main errors of wattmeters and the methods used to overcome each of them.   (5 marks)

·b) The circuit shown can be used to measure the power and power factor of the connected load. **Evaluate** the expression that can be used to compute both the power and power factor. **Draw** the vector diagram of the circuit.   (5 marks)

Third Question (10 Marks)

-a) **Describe briefly** (with the help of neat diagram) the construction and the principle of operation of the dc galvanometer. **State** the methods used to improve the sensitivity of the galvanometers.   (5 marks)

-b) A moving coil voltmeter with resistance of 20 ohm gives full scale deflection of $120°$ when a potential difference of 100 mV is applied across it. The moving coil has dimensions of 30mm*25mm and is wound with 100 turn. The spring constant is $0.375*10^{-6}$ Nm/deg. **Find** the flux density in the air gap. **Find also** the diameter of copper wire of coil winding if 30% of instrument resistance is due to coil winding ? for copper $= 1.7*10^{-8}$ ohm.m?   (5 marks)

☞   الأسئلة من صفحتين من فضلك اقلب الورقة   ☜

Fourth Question (10 Marks)

4-a) **Explain** with the help of neat sketch, the construction and operating principle of a current transformer. **Why** it is essential to shorten the secondary of the current transformer is not connected to a load   (5 marks)

4-b) **Explain** with the help of neat sketch the use of internal resistances to change the range of reading of both a moving coil voltmeter and a moving coil ammeter.

(5 marks)

Fifth Question (10 Marks)

5-a) **Explain** the construction of a Permanent Magnet Moving Coil (PMMC) meter with the help of neat sketch. How are different forces produced? Enlist the advantages and disadvantages of PMMC meters   (5 marks)

5-b) Two wattmeters are connected to measure the power in 3 phase 3 wire balanced system gave readings of 5000 W and 1000 W .

 i) **Draw** a schematic diagram of the system connection.
 ii) **Calculate** the power and the power factor if:
     a) both meters read direct, and
     b) the second meter has to be reversed.   (5 marks)

Sixth Question (10 Marks)

6-a) **Give** SHORT answer of FOUR ONLY of the following questions: (4 marks)

أجب باختصار على أربعة فقط من الأسئلة التالية مع كتابة رقم السؤال كما هو فى ورقة الأسئلة:

1- What is the function of electrical measuring instruments?

2- What happen when a voltmeter is connected in series with the circuit?

3- What is the effect of temperature on an indicating instrument?

4- Why an ammeter should be of very low resistance?

5- Is it right to use an ammeter and voltmeter to measure power in ac circuits? Why?

6-b) The four arms of an alternating current bridge are made up as follows:

arm ab : an imperfect capacitor C_1 with an equivalent series resistance of r_1;

arm bc : a non inductive resistance R_3 ;

arm cd : a non inductive resistance R_4 ;

arm da : an imperfect capacitor C_2 with an equivalent resistance of r_2 in series with a resistance R_2.

A supply of **450** Hz is given between terminal **a** and **c**, and the detector is connected between **b** and **d**.

 i) **Evaluate** expressions for C_1 and r_1 to give balance.
 ii) **Calculate** the values of C_1 and r_1 at balance for: R_2= 4.8 Ω; R_3= 2000 Ω; R_4= 2850 Ω; C_2 = 0.5 μF and r_2 = 0.4 Ω.   (6 marks)

With my Best Wishes

Prof. Magdi El-Saadawi   16/6/2011