Menofiya University Faculty of Engineering Dept of Mech. Power Engineering Date: 1 /1/2014 Total Marks:90	جامعة المنوفية	Final Term Exam Academic Year: 2013-2014 2nd Power Allowed Time: 3 Hours

Subject/ Code: **Measurements and Electronics / ELE217**
This exam measures ILO's no. A3, B1, C1, C3, C4)
Remarks: No. of pages: 2   No. of questions: 6
Allowed Tables and Charts: (None)

Answer All The Following Questions:

The First Question (10- Marks)

a) **Define: Accuracy - Sensitivity – Error-Types of Error**

b) A set of independent current measurements was taken by six observers and recorded as:
12.8 mA, 12.2 mA, 12.5 mA, 13.1 mA, 12.9 mA and 12.4 mA.   Calculate:
 1) The arithmetic mean   2) The deviations from the mean

The Second Question (20- Marks)

a) Derive the torque equations of the PMMC instrument. Then, write the general equation of motion for the PMMC instrument.

b) A basic d'Arsonval movement with internal resistance of 100Ω and half scale current deflection of 0.5 mA is to be converted into a multi-range d.c voltmeter with voltages ranges of 10V, 50V, 250V, and 500V. Calculate the value of the multiplier resistances for the multiple range dc voltmeter circuit shown.
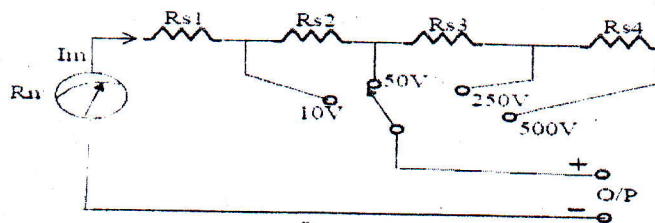
c) A moving iron voltmeter reads correctly 250 Volt, when connected to 250 v (DC SUPPLY), determine its reading when connected to 250 v, 50 Hz (AC SUPPLY). The instrument coil has a resistance of 500 Ω and an inductance of 1 H. (take the series non reactive resistance of 2000 Ω)

The Third Question (15- Marks)

a) Explain one kind of the wattmeter errors and how to Compensate it ?

d) A 250 V -10 A dynamometer wattmeter has resistance for current and voltage coils of 0.5, 12500 Ω respectively. Find the percentage error when unity power factor load are connected at 250 volt for currents of 4 A.

Question (4)   [15]

(a) Draw the block diagram of a basic oscilloscope. Describe briefly the function of each block. Then, show how it can be operated in the Y-t mode. If one cycle of 1.25 KHz sine wave fills exactly 8 divisions wide onto a CRT graticule, what is the setting of the Time/Div switch.

(b) Draw and briefly explain, with the aid of timing diagram, the operation of a Mod-10 counter.

(c) Using Linear Variable Differential Transformer (LVDT), show how to measure a liquid level in a tube.

Question (5)   [15]

(a) In the common cathode 7-segment LED display, if the BCD number 0101 is applied to the BCD-to-7segment decoder/driver. What are the decoder/driver output and the decimal digit to be displayed.

(b) Draw and explain the operation of a dual-slope digital voltmeter (DVM).

(c) For a dual-slope DVM, derive expressions for the capacitor voltage during the charging and discharging periods. If $R = 10$ KΩ and $C = 0.1$ µF for the integrator. Also, if $V_X = 3$ V and $V_F = 5$ V, calculate:
   i) The integrator time constant.
   ii) The capacitor charging and discharging currents.
   iii) The charging and discharging slops.

Question (6)   [15]

(a) Using suitable transducer, show how to measure the strain on a metal bar. Avoid thermal effect.

(b) A resistance strain gauge with a gauge factor of 4 is fastened to a steel bar that stretches from 25 to 25.01 cm. If the strained resistance value of the gauge is 125.2 Ω, what is the resistance value before strain.

(c) Using three decade counters with digital readout, show how to measure the frequency of a sinusoidal signal of about 6500 Hz. What is the time setting of COUNT in millisecond.

Good Luck