Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- Vth SEMESTER–EXAMINATION – MAY/JUNE - 2012

Subject code: 152402 **Date: 02/06/2012**

Subject Name: Electrical Measurement and Electronics Instruments

Time: 02:30 pm – 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1

(a) Give the classification of instruments and distinguish the deflection and null type instruments. [8]

(b) Define following: [6]
(i) Absolute units
(ii) Fundamental units
(iii) Derived units

Q.2

(a) Define terms: [8]
(i) Repeatability (ii) Accuracy (iii) Precision (iv) Static sensitivity (v) Resolution (vi) Linearity (vii) Static error (viii) Static correction.

(b) 0-10 A ammeter has a guaranteed accuracy of 1.5 percent of full scale reading. The current measured by the instrument is 2.5 A. Calculate the limiting values of current and the percentage limiting error. [6]

OR

(b) A moving Coil instrument has following data: [6]
Number of turns = 100, width of coil = 20mm, depth of coil = 30mm, flux density in gap = 0.1 Wb/m^2. Calculate the deflecting torque when carrying a current of 10 mA. Also calculate the deflection if the control spring constant is 2×10^{-6} Nm/degree.

Q.3

(a) Explain the construction and derive the torque equation of PMMC type instruments. [8]

(b) A moving coil voltmeter with a resistance of 20Ω gives a full scale deflection of 102^0 when a potential difference of 100 mV is applied across it. The moving coil has dimensions of 30mm × 25mm and is wound with 100 turns. The control 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. The specific resistance for copper = $1.7\times 10^{8}\Omega$m. [6]

OR

Q.3

(a) Explain the series-type ohmmeter. Design a series type ohmmeter. The movement to be used requires 0.5mA for full scale deflection and has an internal resistance of 50Ω. The internal battery has a voltage of 3 V. the desired value of half scale resistance is 3000Ω. Calculate (a) the values of series and parallel resistances R_1 and R_2; (b) the range of values of R_2, if the battery voltage may vary from 2.7 V to 3.1 V. use the value of r1 calculated in (a). [8]

(b) Distinguish current transformers and potential transformers. [6]

Q.4

(a) Explain the Kelvin Double Bridge method of measurement for low resistances. [8]

(b) Four arms of a Wheatstone bridge are as follows: [6]
AB = 100Ω; BC = 1000Ω; CD = 4000Ω and DA = 50Ω.
The galvanometer has a resistance of 20Ω and is connected across BD. A source of 10 d.c. is connected across AC. Find the current through the galvanometer. What should be the resistance in the arm DA for no current through the galvanometer?

OR

Q.4

(a) Draw the circuit of a Wheatstone bridge and derive the conditions of balance. [8]

(b) Explain the measurement of capacitance using De Sauty's bridge. [6]

Q.5

(a) Explain the operation of single-phase energy meters. [8]

(b) Explain the construction and working principle of Ferrodynamic wattmeters. [6]

OR

Q.5

(a) Write the significance and applications of different types of probes. [8]

(b) Explain the special features incorporated in an electrodynamometer type of wattmeter so that it can be used for low power factor applications. [6]