

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

## GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII • EXAMINATION – WINTER • 2014

**Subject Code: 170803**

**Date: 04-12-2014**

**Subject Name: Electrical and Electronics Measuring Instruments**

**Time: 10:30 am - 01:00 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) Explain the construction and working of 1- $\Phi$  induction type energy meter. Also draw the phasor diagram. **07**
- (b) Describe the different controlling methods used in an analog instrument. Compare them and justify scale uniformity for both controlling methods. **07**

- Q.2** (a) Explain construction and working of PMMC instrument & derive the torque equation. **07**
- (b) The inductance of a moving iron ammeter with a full scale deflection of  $90^\circ$  at 1.5 A, is given by the expression:  $L = (200 + 40\theta - 4\theta^2 - \theta^3) \mu\text{H}$ . Where,  $\theta$  is the deflection in radian from the zero position. Estimate the angular deflection of the pointer for a current of 1.0 A. **07**

**OR**

- (b) A Dynamometer wattmeter is used to measure the power factor of a  $20\mu\text{F}$  capacitor. The pressure coil of the wattmeter having a resistance  $1000\Omega$  and an inductive reactance of  $15\Omega$  is connected across a 50Hz supply. The current coil of the wattmeter, a variable resistor R and the capacitor are connected in series across the same supply. The wattmeter deflection is made zero by adjusting the value of R to  $1.65\Omega$ . If the current coil resistance is  $0.1\Omega$  and its inductance negligible: Determine the power factor of the capacitor. **07**

- Q.3** (a) List various methods of high resistance measurement. Explain Megohm bridge method in detail. **07**
- (b) Derive the equations of balance for the Anderson's bridge. Draw the phasor diagram under the balance condition and give the advantage and disadvantage. **07**

**OR**

- Q.3** (a) State the application of modified DeSauty's bridge. Explain its working. Draw the phasor diagram and derive the equation for unknown capacitance. **07**
- (b) In the simple Wheatstone bridge, the values of resistances of various arms are  $P=1000\Omega$ ,  $Q=100\Omega$ ,  $R=2005\Omega$  and  $S=200\Omega$ . The Battery has an emf of 5V and negligible internal resistance. The Galvanometer has a current sensitivity of  $10\text{ mm}/\mu\text{A}$  and internal resistance of  $100\Omega$ . Calculate the deflection of Galvanometer and the sensitivity of the bridge in terms of deflection per unit change in resistance. **07**

- Q.4 (a)** Draw the equivalent circuit and phasor diagram of a current transformer. Derive the expression for its ratio and phase angle error. **07**
- (b)** Explain frequency selective wave analyzer with block diagram. **07**
- OR**
- Q.4 (a)** A Potential transformer, ratio 1000/100 volt, has the following constant: **07**  
 Primary resistance = 94.5  $\Omega$ ,  
 Secondary resistance = 0.86  $\Omega$ ,  
 Primary reactance = 66.2  $\Omega$ ,  
 Total equivalent reactance = 110  $\Omega$ ,  
 No load current = 0.02 A at 0.4 power factor.  
 Calculate:  
 (i) Phase angle error at no load and  
 (ii) Burden in VA at unity power factor at which the Phase angle will be zero.
- Q.4 (b)** Why are FETs used in differential amplifier type of electronic voltmeter? Draw and Explain the equivalent circuit of such a voltmeter. **07**
- Q.5 (a)** What are lissajous figures? How can you measure the phase difference between two sinusoidal signals using a CRO with this figure? **07**
- (b)** Explain the block diagram of a general telemetry system. State different types of telemetry system. Explain land line telemetry system and its application system. **07**
- OR**
- Q.5 (a)** Write technical notes on active and passive transducers. **07**
- (b)** (i) Why platinum is commonly used metal for RTD? **02**  
 (ii) Why thermocouple is called active transducer? **02**  
 (iii) Core of LVDT is slotted- justify the statement. **03**

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