

**4E4122**

Roll No. \_\_\_\_\_

Total No of Pages: **4****4E4122****B. Tech. IV Sem. (Main) Exam., June/July-2014****Electronics Instrumentation & Control Engg.****4EI3A Electrical Measurement****Common with EE, EX & EI****Time: 3 Hours****Maximum Marks: 80****Min. Passing Marks: 24****Instructions to Candidates:-**

*Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

*Units of quantities used/ calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

1. \_\_\_\_\_

2. \_\_\_\_\_

**UNIT-I**

Q.1. (a) A permanent magnet moving coil instrument has a coil of dimensions 15mm × 12mm. The flux density in the air gap is  $1.8 \times 10^{-3}$  wb/m<sup>2</sup> and the spring Constant is  $0.14 \times 10^{-6}$  Nm/rad. Determine the number of turns required to produce an angular deflection of 90 degrees when a current of 5mA is flowing through the coil. [8]

(b) Explain the testing and calibration of single phase energy meter by phantom loading. [8]

**OR**

Q.1. (a) The law of deflection of a moving iron ammeter is given by  $I = 4\theta^n$  ampere where  $\theta$  is the deflection in radian and  $n$  is a constant. The self inductance when the meter current is Zero is 10 mH. The Spring constant is 0.16 N-m/rad.

(i) Determine an expression for self inductance of the meter as a function of  $\theta$  and  $n$ .

(ii) With  $n = 0.75$ , Calculate the meter current and the deflection that corresponds to a self – inductance of 60 mH. [10]

(b) Explain the errors in wattmeter and energy meter and their compensation techniques. [6]

**UNIT-II**

Q.2. (a) A 1000/5 A, 50 HZ current transformer has a secondary burden comprising a non inductive impedance of  $1.6\Omega$ . The primary winding has one turn. Calculate the flux in the core and ratio error at full load. Neglect leakage reactance and assume the iron loss in the core to be 1.5W at full load. The magnetizing mmF is 100A. [8]

(b) Explain the effect of secondary burden on the ratio and phase errors of a current transformer. [8]

**OR**

Q.2. (a) A potential transformer, ratio 1000/100 volt, has the following constants:

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 (ii) burden in VA at unity power factor at which the phase angle will be zero. [10]

(b) Explain the Arnold's method for testing of current transformer. [6]

### UNIT-III

Q.3. Explain the construction and working of co-ordinate type a.c. Potentiometer. How is it Standardized? Discuss about sources of error in these instruments. [16]

OR

Q.3. Explain with the help of suitable diagrams, how a.c. potentiometer can be used for: ---

(i) Calibration of voltmeters and ammeters.

(ii) Calibration of wattmeters and energy meters. [16]

### UNIT-IV

Q.4. (a) What are the difficulties associated with the measurement of low resistance? Explain the potentiometer method for the measurement of low resistance. [8]

(b) Explain the loss of charge method for measurement of insulation resistance of cables. [8]

OR

Q.4. (a) Explain the working principle of price's Guard wire method for the measurement of High resistance. [8]

(b) Explain the importance of the value Earth's resistance. Discuss about the fall of potential method for measurement of Earth resistance. [8]

## UNIT-V

- Q.5. (a) Explain the working of Anderson Bridge for self-inductance measurement with proper phasor diagram. [8]
- (b) What are the sources of errors in bridge circuits? What are the precautions and methods used to minimize the errors? [8]

### OR

- Q.5. (a) Explain the working of Heaviside's bridge for mutual inductance measurement with proper phasor diagram. [8]
- (b) Write short notes on Wagner Earth device with suitable diagram. [8]

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