*Name :* .....

*Roll No. :* .....

*Invigilator's Signature :* .....

**CS/B.TECH(EEE(O)/PWE(O)/BME(O)/EE(O))/SEM-3**

**/EE-302/2011-12**

# 2011
# ELECTRICAL AND ELECTRONIC MEASUREMENTS

*Time Allotted :* 3 Hours *Full Marks :* 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

## GROUP – A

### ( Multiple Choice Type Questions )

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

   i) The scale of the moving iron instrument is

      a) linear b) non-linear

      c) both (a) and (b) d) none of these.

   ii) The breaking torque provided by a permanent magnet in a single phase energymeter is proportional to the

      a) square of the flux of the permanent magnet

      b) speed of the meter

      c) distance of the permanent magnet from the centre of the revolving disc

      d) all of these.

iii) Capacitance can be measured by

a) Maxwell's bridge

b) DeSauty's bridge

c) Wheatstone bridge

d) None of these.

iv) Frequency can be measured by

a) Maxwell's bridge

b) Heaviside-Cambell bridge

c) Schering bridge

d) Wien's bridge

v) In induction type energy meters, high driving torque can be obtained by

a) Making the disc purely resistive

b) Making the phase difference between the two operating fluxes as large as possible

c) Making the disc impedance as low as possible

d) All of the above.

vi) Creeping in a single phase energy meter can be avoided by

a) Using good quality bearings

b) Increasing strength of the brake magnet

c) Placing small iron piece on edge of the rotating disc

d) All of these.

vii) Gauge factor of strain gauge is given as

a) $G_f = (\Delta R/R)/(\Delta L/L)$ b) $G_f = (\Delta L/L)/(\Delta R/R)$

c) $G_f = (\Delta R/R)/(\Delta D/D)$ d) none of these.

viii) Holes are drilled on opposite sides of the disc of an inducting type energymeter to

a) avoid creep on no load

b) balance the disc

c) dissipate the energy due to eddy currents

d) increase the deflecting torque.

ix) The secondary of a CT is

a) never left short-circuited

b) never left open circuited

c) always kept open-circuited

d) none of these.

x) The time base of a CRO is developed by

a) square waveform

b) sawtooth waveform

c) sine waveform

d) output from a Built-in-clock.

xi) The Bridge used for measuring dissipation factor of a capacitor is

a) Campbell's bridge b) Schering bridge

c) Anderson's bridge d) Owen's bridge.

xii) The Insulation resistance of a domestic wiring is to be measured. The instrument preferred is

a) Kelvin's double ridge b) Ohm-meter

c) Potentiometer d) Megger.

## GROUP – B

### ( Short Answer Type Questions )

Answer any *three* of the following. 3 × 5 = 15

2. Develop the torque equation of the moving coil instrumentation. 5

3. How can a potentiometer be used—

   a) For calibration of a voltmeter ?

   b) For calibration of wattmeter ?

4. Describe with a neat diagram, the Wien bridge method for measuring the unknown frequency. 5

5. What is phantom loading ? Explain with an example how it is more advantageous than testing with direct loading. 1 + 4

6. Explain the procedure of measurement of high voltage by *dc* potentiometer. 5

## GROUP – C

### ( Long Answer Type Questions )

Answer any *three* of the following. 3 × 15 = 45

7. a) Define the terms 'Accuracy', 'Precision', 'Resolution'.

   b) What are the main causes for instrumental errors ?

   c) The output voltage of an amplifier was measured at eight different intervals using the same digital voltmeter with the following results : 20.00, 19.80, 19.85, 20.05, 20.10, 19.90, 20.25, 19.95. Which is the most precise measurement ?

d) The current through a resistor is 3.0A, but measurement gives a value of 2.9A.

Calculate the following :

(i) Absolute error ?

(ii) Per cent error ?

(iii) Per cent accuracy of the measurement ?

3 + 6 + 3 + 3

8. a) Draw and explain different blocks of a CRO. Write the operating principle of a CRT.

b) What are the difference between dual trace and dual beam oscilloscopes ? 4 + 8 + 3

9. a) What are limitations of Wheatstone bridge for resistance measurement ?

b) How can low resistance be measured by Kelvin's Double bridge method ?

c) Why are guard circuits used for measurement of high resistance ?

d) Describe Murray Loop test for locating ground fault or short-circuit fault in cable. 2 + 5 + 3 + 5

10. a) Write briefly about the construction of an electrodynamometer type instrument.

    b) Derive the torque equation of the instrument when an alternative current is passed through the coil.

    c) List the principal errors of this type of instrument.

    5 + 7 + 3

11. a) Draw the equivalent circuit and phasor diagram of a current transformer.

    b) Derive the expression for ratio and phase angle errors.

    c) Explain the difference between CT and PT. 4 + 8 + 3

12. Write short notes on any three of the following : 3 × 5

    a) Signal generator

    b) Frequency counter

    c) Rectifier type instrument

    d) Electrostatic instrument

    e) Megger.