



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. $3 \times 5 = 15$

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



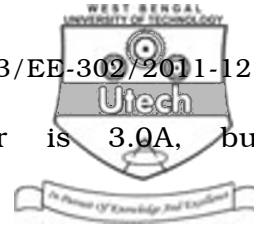
3. How can a potentiometer be used—
- a) For calibration of a voltmeter ?
 - b) For calibration of wattmeter ?
4. Describe with a neat diagram, the Wien bridge method for measuring the unknown frequency. 5
5. What is phantom loading ? Explain with an example how it is more advantageous than testing with 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 ?
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.

4 + 8 + 3

2 + 5 + 3 + 5



10. a) Write briefly about the construction of an electro-dynamometer 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.

