Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(EIE-OLD)/SEM-3/EE-302(EI)/2011-12

2011
ELECTRICAL MEASUREMENTS AND INSTRUMENTS

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 torque produced in a wattmeter is proportional to

a) The average value of currents in two coils

b) The rms value of currents in two coils

c) The average value of supply voltage

d) None of these.

ii) Murray loop test is used for location of ..... on a cable.

a) Short circuit fault

b) Ground fault

c) Both ground fault and short circuit fault

d) Open circuit fault.

iii) Which of the following instruments has the highest frequency range with accuracy within reasonable limits ?

a) Moving iron b) Electrodynamometer

c) Thermocouple d) Rectifier.

iv) Which of the following bridges is preferred for the measurement of inductance having high Q-factor ?

a) Maxwell's bridge b) Hay bridge

c) Owen bridge d) DeSauty's bridge.

v) Power in a 3-phase four-wire circuit can be measured by using

a) Two wattmeters b) Four wattmeters

c) Three wattmeters d) One wattmeter.

vi) In an electrodynamometer type of wattmeter

a) the current coil is fixed

b) the pressure coil is fixed

c) both the coils are movable

d) any of the coils is fixed.

vii) Inductance is measured by

a) Wheatstone bridge b) Kelvin's double bridge

c) Maxwell's bridge d) Wien's bridge.

viii) Moving iron type instrument normally uses

a) air friction damping b) fluid friction damping

c) eddy current damping d) none of these.

ix) Standardization of potentiometers is done in order to order that, they become

a) accurate

b) precise

c) accurate and direct reading

d) accurate and precision.

x) Creeping in a single phase induction type energy meter may be due to

a) overcompensation for friction

b) overvoltage

c) vibrations

d) all of these.

xi) In two wattmeter method of measuring 3-phase power factor is 0.5, then one of the three wattmeter will read

a) $w/2$ b) 0

c) $\sqrt{3}\, w$ d) $w/\sqrt{3}$.

xii) High voltage measurement can be done by

a) PMMC

b) Electrostatic type

c) Electrodynamometer type

d) Moving iron type.

GROUP – B

(Short Answer Type Questions)

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

2. Describe with a neat diagram, he Wien bride method for measuring unknown frequency.

3. Derive the equation of balance for an Anderson's bridge. Draw the phasor diagram for condition under balance. 3 + 2

4. What are the absolute and secondary type instruments ? Briefly describe the forces that act on a deflecting type instrument. 2 + 3

5. Draw a neat sketch of PMMC type instrument and show that angular deflection of the moving system is proportional to the measured current when controlling torque is provided by spring. 2 + 3

6. Discuss briefly the principle of measurement of high resistance by "Loss of charge method".

GROUP – C

(Long Answer Type Questions)

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

7. What are different types of Moving Iron instruments ? Deduce the general Torque equation of a Moving Iron type instruments, to show that angular deflection is proportional to square of rms value of the operating current. What are the errors in a M.I. type instrument and how frequency error can be overcome ? 2 + 6 +7

8. Describe the construction of single-phase Induction type Energy meter.

   Show that total number of revolutions in such instruments is proportional to energy supplied to meter only when the phase angle between the supply voltage and pressure coil flux is 90 degrees.

   What do you mean by creep of an energy meter and how is it overcome ? 4 + 7 + 4

9. a) Why is a damping force required in a moving system of an instrument ?

   b) Deduce the damping torque expression in a metal former moving in magnetic field.

   c) Describe different types of damping. 3 + 5 + 7

10. a) For what specific purpose, are shunts used in ammeter and multipliers used in a voltmeter ?

    b) Why are PMMC instruments used only for DC applications ?

    c) What is a swamping resistance ? 6 + 6 + 3

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

    b) Derive the expressions for ratio and phase angle error.

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

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

    a) Megger

    b) Thermal type instruments

    c) Gravity control

    d) Murray loop test

    e) Kelvin's double bridge.