Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(EIE-NEW)/SEM-3/EI-301/2011-12

2011

ELECTRICAL MEASUREMENTS & 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 : $10 \times 1 = 10$

i) Electrostatic-type instruments are primarily used as

a) ammeters b) voltmeters

c) wattmeters d) ohmmeters.

ii) A set of reading has a wide range and therefore it has

a) low precision b) high precision

c) low accuracy d) high accuracy.

iii) Current in the primary winding of CT depends on

a) burden in the secondary winding of the transformer

b) load connected to the system in which the CT is being used for measurement

c) both burden of the secondary and load connected to the system

d) none of these.

iv) The main source of error in an accelerometer is the presence of

a) gravitation force b) electromagnetic force

c) centrifugal force d) all of these.

v) The high torque to weight ratio in an analog instrument indicates
   a) high friction loss
   b) low friction loss
   c) nothing as regards friction loss
   d) none of these.

vi) The secondary of a CT is
   a) never left open circuited
   b) never left short circuited
   c) always kept open circuited
   d) none of these.

vii) The advantage of Varley loop tests over Murray loop test is
   a) they can be used for localizing of short circuit faults
   b) they can be used for localizing of earth faults
   c) the loop resistance can be experimentally determined
   d) their accuracy is higher.

viii) Which instrument used for both *ac* and *dc* measurements ?
   a) Moving iron b) Electrodynamometer
   c) Electrostatic d) All of these.

ix) Maxwell bridge can be used for measurement of inductance with
   a) high *Q* factors
   b) very low *Q* factors
   c) medium *Q* factors
   d) wide range of *Q* factor variations.

x) A megger is used for measurement of
   a) low valued resistances
   b) medium valued resistances
   c) high valued resistances
   d) all of these.

xi) Calibration in a *DC* potentiometer is done with the help of a standard cell of voltage

a) 1·5 volt b) 1·01864 volt

c) 1·001864 volt d) 1·0864 volt.

xii) The term 'threshold' used in instrumentation means

a) the smallest change in input which can be detected

b) a measure of linearity of the system

c) the smallest input which can be detected

d) a measure of precision of the system.

GROUP – B
(Short Answer Type Questions)

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

2. Define precision and accuracy. Highly précised instrument need not be highly accurate. Explain. 3 + 2

3. The following 10 observations were recorded when measuring a voltage 41·7, 42·0, 41·8, 42·0, 42·1, 41·9, 42·0, 41·9, 42·5, 41·8 volt. Find

a) the Mean

b) the average deviation

c) standard deviation

d) probable error of one reading.

4. What are the main limitations of Wheatstone bridge ? How are these limitations eliminated ? Explain clearly. 1 + 4

5. Describe the Murray loop test method for localization of cable fault of short circuit type.

6. What are the advantages of instrument transformer over a shunt-on multiplier ?

GROUP – C
(Long Answer Type Questions)

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

7. a) Explain the working principle of electrodynamometer type instrument.

b) A moving coil instrument gives a full scale deflection for a current of 20 mA with potential difference of 200 mV across it. Calculate —

i) shunt required to use it as an ammeter to get range of 0-200 A.

ii) multiplier required to use it as a voltmeter of range 0-500 V.

c) Mention some advantages and disadvantages of moving iron instrument. 5 + 5 + 5

8. a) Draw the equivalent circuit for the current transformer and hence find the expression of ratio error with a suitable phasor diagram.

b) Why does creeping occur in energymeter and how can it be eliminated ? (3 + 5 + 2) + (2 + 3)

9. a) State the limitations of low resistance measurement. Describe the working of Kelvin double bridge with necessary calculation.

b) How insulation resistance can be measured using loss of charge method ?

c) State the conditions for *A.C.* bridge balance. (2 + 6) + 5 + 2

10. a) Describe with circuit diagram how Drysdale or Gall potentiometer is used to measure *A.C.* voltage.

b) Draw the circuit diagram of *D.C.* potentiometer and explain how it works.

c) How can potentiometer be used for (i) calibration of voltmeter (ii) calibration of wattmeter ? 5 + 5 + 5

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

a) Rectifier type instrument

b) Bath tub curve

c) Megger

d) Chi-square test

e) MTTF.