Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(EE)/SEM-3/EE-302/2009-10

2009

ELECTRICAL & ELECTRONICS MEASUREMENT

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) A Wheatstone bridge cannot be used for precission measurements because errors due to

      a) resistance of connecting leads

      b) thermo-electric emf

      c) contact resistance

      d) all of these.

   ii) Maxwell's inductance-capacitance bridge is

      a) Low Q coils

      b) Medium Q coils

      c) High Q coils

      d) Low and Medium Q coils.

iii) Electrodynamic type instruments can be used as

a) standard instruments only

b) transfer instruments only

c) both standard and transfer instruments

d) indicator type instruments.

iv) Megger is used for the measurement of

a) low resistance b) medium resistance

c) high resistance d) none of these.

v) The time base of a CRO is developed by

a) squared waveform b) saw-tooth waveform

c) sine waveform d) none of these.

vi) In an electrodynamic type watmeter

a) the current coil is made fixed

b) the pressure coil is made fixed

c) any of the current or pressure coil can be made fixed

d) both coils are movable.

vii) In a CRT, the focusing anode is located

a) between pre-acelarating and acelarating anode

b) after acelarating anode

c) before pre-acelarating anode

d) none of these.

viii) An aquadag is used in a CRO to collect

a) primary electrons

b) secondary emission electrons

c) both primary and secondary emission electrons

d) none of these.

ix) LVDT is a

a) capasitive transducer

b) resistive transducer

c) inductive transducer

d) none of these.

x) Which of the following devices cannot be used to measure pressure ?

a) Strain gauge b) LVDT

c) Piezoelectric crystal d) Pyrometer.

xi) The torque/weight ratio of a Dynamometer instrument is

a) small b) high

c) medium d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Show that the driving torque in a moving iron instrument is given by $T_d = \frac{1}{2} I^2 \frac{dL}{d\theta}$ where symbols have thier usual meaning.

3. What difficulties are encountered in measuring high resistance ? What is a guard circuit ?

4. What are the absolute and secondary instruments ? What are the advantages of electronic instruments ?

5. Explain the procedure of measurement of high voltage by *d.c.* potentiometer.

6. How can you measure the phase difference between two sinusoidal signals using a CRO ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Develop the torque equation of Moving Coil Instrument. 8

b) A moving coil ammeter has a fixed shunt of 0·02 Ω with a coil resistance of R = 1000 Ω and a potential difference of 500 mV across it. Full scale deflection is obtained.

i) To what shunted current does it corresponds ?

ii) Calculate the value of R to give full scale deflection when shunted current I is

- 20 amp
- 60 amp

iii) With what value of R is 45% deflection obtained with I = 100 A ? 5

c) Draw the circuit diagram of an Electrodynamic wattmeter with power lebelling. 2

8. a) Draw the diagram of laboratory type (Cormpton's) D.C. potentiometer. What is meant by standardization of potentiometer ? 6

b) How can a potentiometer be used

i) for calibration of a voltmeter

ii) for calibration of a wattmeter ? 6

c) Voltage drop across the low resistance under test is 0·83942 V. Voltage drop across a standard resistance connected in series with the unknown is 1·01575. If the value of standard resistance is 1·0014 Ω. Calculate the value of unknown resistance. 3

9. a) What are the advantages and disadvantages of electrodynamometer type instruments ? 8

b) A simple shunted ammeter using a basic meter movement with an internal resistance of 1800 Ω and a full scale deflection current of 100 μA is connected in a circuit and gives reading of 3·5 mA on its 5 mA scale. The reading is checked with a recently calibrated *d.c.* ammeter which gives a reading of 4·1 mA. The implication is that the ammeter has a faulty shunt on its 5 mA range. Calculate

i) the actual value of faulty shunt

ii) the current shunt for the 5 mA range. 7

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

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

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

11. a) Draw the block diagram of a CRO and explain different of the function of the different blocks. 8

b) What are the function of Time-base generator in CRO ? 3

c) What are Lissajous figures ? Explain how phase and frequency can be measured using these figures. 1 + 3