

Name :

Roll No. :

Inspector'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 precision 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.

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- iii) Electrodynamc 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 electrodynamc type wattmeter
- 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-acclarrating and acclarrating anode
 - b) after acclarrating anode
 - c) before pre-acclarrating 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) capacitive 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 x 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 their 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 x 15 = 45

7. a) Develop the torque equation of Moving Coil Instrument. 8
- b) A moving coil ammeter has a fixed shunt of 0.02Ω with a coil resistance of $R_c = 1000 \Omega$ 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 is
- 20 amp
 - 60 amp
- iii) With what value of R is 45% deflection obtained with $I = 100 \text{ A}$? 5
- c) Draw the circuit diagram of an Electrodynmic wattmeter with power labelling. 2
8. a) Draw the diagram of laboratory type (Cornption'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 1.0014Ω . Calculate the value of unknown resistance. 3

9. a) What are the advantages and disadvantages of electroammeter type instruments? 8
- b) A simple shunted ammeter using a basic meter movement with an internal resistance of $1800\ \Omega$ and a full scale deflection current of $100\ \mu\text{A}$ is connected in a circuit and gives reading of $35\ \text{mA}$ on its $5\ \text{mA}$ scale. The reading is checked with a recently calibrated d.c. ammeter which gives a reading of $4.1\ \text{mA}$. The implication is that the ammeter has a faulty shunt on its $5\ \text{mA}$ range. Calculate
- i) the actual value of faulty shunt
 - ii) the current shunt for the $5\ \text{mA}$ 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 Trig-base generator in CRO ? 3
- c) What are Lissajous figures? Explain how phase and frequency can be measured using these figures. 1 + 3