Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(EEE, BME, PWE)/SEM-3/EE-302/2009-10

2009

ELECTRICAL & 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 : $10 \times 1 = 10$

i) Electrostatic type instruments are primarily used as

a) Ammeters b) Wattmeters

c) Voltmeters d) Ohmmeters.

ii) In an induction type meter, maximum torque is obtained when the phase angle between the two fluxes is

a) 0° b) 45°

c) 60° d) 90°.

iii) The horizontal deflection plates in a CRT are 20 mm long and 5 mm apart. The centre of the plates is 20 cm from the screen. Accelerating voltage is 2500 V.
The deflection sensitivity is

a) 0·16 mm/V b) 0·50 mm/V

c) 0·32 mm/V d) 100 mm/V.

iv) A high frequency a.c. signal is applied to a PMMC instrument. If the r.m.s. value of a.c. signal is 2 V, the reading of the instrument will be

a) zero b) 2 V

c) 2 |2 V d) 4 |2 V.

v) Which instrument has the lowest resistance ?

a) Ammeter b) Voltmeter

c) Frequency meter d) Megger.

vi) Which of the following instruments is not suitable for measurement of X_L / R of a coil ?

a) Maxwell's Bridge b) Hay Bridge

c) Q-Meter d) Schering Bridge.

vii) Thermistor is used for measurement of

a) Temperature b) Pressure

c) Flow d) Displacement.

viii) Megger is used to measure resistance which is

a) low b) medium

c) high d) none of these.

ix) The time base of a CRO is developed by

a) square waveform

b) saw-tooth waveform

c) sine wave waveform

d) none of these.

x) Which meter has the highest accuracy in the prescribed limit of frequency ?

a) Moving iron

b) Rectifier type

c) PMMC

d) Electrodynomometer.

xi) In a CRT, the focussing anode is located at

a) between pre-accelerating and accelerating anode

b) after accelerating anode

c) before pre-accelerating anode

d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. Define limiting errors. Derive the expression of relative limiting errors. 2 + 3

3. Explain the effect of secondary burden on the ratio and phase errors of a current transformer. Define the terms transformation ratio and nominal ratio. 3 + 2

4. a) Classify resistance from three point of view of measurements.

   b) Describe in brief the different methods used for the measurement of resistance. 1 + 4

5. What do you mean by standardisation of potentiometer ? How is high voltage measured by potentiometer ? 2 + 3

6. Explain with suitable diagram the working of a signal generator. 5

7. Why is a moving coil type instrument unable to measure *a.c.* ? What type of a scale does a moving iron type instrument have ? Explain the type of damping used.

   1 + 1 + 3

GROUP – C

(Long Answer Type Questions)

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

8. a) Draw the block diagram of an oscillascope and explain its major system.

   b) State the function of Sweep Generation circuit in a CRO.

   c) Give the comporison between "Dual trace and Dual beam" Oscilloscopes. 8 + 4 + 3

9. a) Describe the construction *n* and working of PMMC type of instrument. Derive the torque equation of MI type of instrument. 6 + 4

   b) Calculate the constants of a shunt to extend the range of 0 – 5 A MI ammeter to 0 – 50 A. The instruments constants are R = 0·09 Ω and L = 90 μH. If the shunt is made non-inductive and the combination is correct on *d.c.* find the full scale error at 50 Hz. 5

10. a) Draw the quivalent circuit and phasor of CT. Derive the expression of ratio and phase angle errors. 4 + 6

b) A 1000/5 A, 50 Hz CT has a secondary burden comprising of a non-inductive impedence of 1·6 Ω. The primary winding has one turn. Calculate the flux in core and the ratio error at full-load. Neglect leakage reactance and assume the iron loss in the core to be 1·5 w at full-load. The magnetizing mmF is 100 A. 5

11. a) Draw and explain with phasor diagram the working principle of Anderson bridge. 5

b) Describe constructional details of electrodynamometer type of wattmeter. 5

c) The power flowing a 3-phase 3-wire balanced load system is measured by 2 wattmeter. method. The reading of wattmeter *A* is 7500 W and that *B* is – 1500 W. If the voltage of the circuit is 400 V what is the value of capacitance which must be introduced in each phase so that the whole power measured appears on wattmeter *A*. The frequency is 50 Hz. 5

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

a) Electrodynamometer instruments

b) Phantom loading

c) Megger

d) Digital voltmeter

e) Drysdale potentiometer.