Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech/(ECE-NEW)/SEM-6/EC-605C/2013

2013

ELECTRONIC MEASUREMENT AND INSTRUMENTATION

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) The term 'threshold' use 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.

   ii) Which instrument used for both *ac* and *dc* measurements ?

   a) Moving Iron b) Electrodynamometer

   c) Electrostatic d) All of these.

   iii) 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 rang of Q factor variations.

iv) 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.

v) The spectrum analyzer displays the signal spectrum in
   a) Time domain b) Frequency domain
   c) Z-domain d) All of these.

vi) Which of the following bridge is used to measure frequency of a signal ?
   a) Maxwell's Bridge b) Anderson's Bridge
   c) DeSauty's Bridge d) None of these.

vii) Creeping is observed in
   a) Watt-Hour meter b) Volt Meter
   c) Ammeter d) Q Meter

viii) Low resistance can be measured by
   a) Wheatstone bridge b) Kelvin's Double bridge
   c) Maxwell's bridge d) Wien's bridge.

ix) Thermocouple is a
   a) Passive transducer
   b) Active transducer
   c) Piezoelectric transducer
   d) none of these.

x) Energy meter is an
   a) Integrating instrument
   b) Recording instrument
   c) Indicating instrument
   d) none of these.

xi) A megger is used for the measurement of
   a) Low value resistance
   b) medium value resistance
   c) high value resistance
   d) all of these.

xii) A digital voltmeter measures
   a) Peak value b) Peak to peak value
   c) rms value d) average value.

GROUP – B

(Short Answer Type Questions)

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

2. Define the terms : Accuracy, Precision, Sensitivity, Lag, Relative limiting error.

3. With suitable diagram describe the operation of an Electro dynamic wattmeter.

4. Briefly explain the working principle of sweep generator.

5. What is the role of multiplexing in a Data Acquisition System ? Explain.

6. Draw and Explain the working principle of a 'true RMS meter'.

GROUP – C

(Long Answer Type Questions)

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

7. a) Explain the functional block diagram of CRO with neat diagram.

   b) What is Lissagous figure ? Explain how phase and frequency can be measured using this figures.

   c) What are the differences between CRO dual beam and dual trace ? What is the function of delay line ?

7 + (1 + 3) + (3 + 1)

8. a) Describe the construction and working principle of a moving iron instrument ? What kind of damping is employed here ?

   b) Why is the scale cramped at the lower end in moving iron instrument ? How does it differ from a PMMC instrument ?

   c) A moving coil instrument has the following data :

   Number of turns : 100, width of the coil = 20 mm, depth of the coil = 30 mm, flux density in the air gap = 0·1 Wb/m^2. Calculate the deflecting torque when carrying a current of 10 mA. Also calculate the deflection if the control spring constant is 2×10^{-6} Nm/degree. (5 + 1) + (2 + 4) + 3

9. a) What are the different types of wave analyzer ? What are the applications of wave analyzer ? Define harmonic distortion and the term total harmonic distortion.

   b) With neat diagram explain the working principle of frequency meter. And what are the techniques used for extending the frequency range ? Give a diagram for measuring the time. (1 + 1 + 3) + (5 + 2 + 3)

10. a) Briefly describe the operation of a digital frequency counter.

    b) What are the errors associated with measurement of frequency and time in frequency counter ?

    c) Explain Digital multi-meter (DMM) with diagram.

    5 + 4 + 6

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

    a) Measurement errors

    b) Multiplex

    c) ϕ-meter

    d) Optical power measurement

    e) Successive approximation-type digital voltmeter.