

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.

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- 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.

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- 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.  $3 \times 5 = 15$

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

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

Briefly explain the working principle of sweep generator.

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

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

**GROUP - C**

**( Long Answer Type Questions )**

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

- 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 =  $0.1 \text{ Wb/m}^2$ . Calculate the deflecting torque when carrying a current of 10 mA. Also calculate the deflection if the control spring constant is  $2 \times 10^{-6} \text{ Nm/degree}$ .  $(5 + 1) + (2 + 4) + 3$
- 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.  $5 + 4 +$
- 11. Write short notes on any *three* of the following :  $3 \times$ 
  - a) Measurement errors
  - b) Multiplex
  - c)  $\phi$ -meter
  - d) Optical power measurement
  - e) Successive approximation-type digital voltmeter.



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