

Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech(EE-New)/SEM-3/EE-302/2010-11
2010-11

ELECTRICAL AND 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) LVDT is used to measure

- | | |
|-----------------|------------------------|
| a) Displacement | b) Temperature |
| c) pH | d) Intensity of light. |

ii) Which of the following bridges is preferred for the
measurement of inductance having high Q-factor ?

- | | |
|-------------------|---------------------|
| a) Maxwell bridge | b) Hay bridge |
| c) Owen bridge | d) De Sauty bridge. |

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- iii) Creeping is observed in
- a) Watt-hour meter b) Wattmeter
 - c) Ammeter d) Power factor meter.
- iv) The household energy meter is
- a) an integrating instrument
 - b) an indicating instrument
 - c) a recording instrument
 - d) none of these.
- v) Swamping resistance is a resistance which added to the moving coil of a meter to
- a) reduce the full scale current
 - b) reduce the temperature error
 - c) increase the sensitivity
 - d) none of these.
- vi) The secondary of a current transformer is
- a) never left open-circuited
 - b) never left short-circuited
 - c) always kept open-circuited
 - d) none of these.

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- vii) Wagner's earth device is used in an a.c. bridge circuit for
- a) eliminating the effect of earth capacitance
 - b) eliminating the effect of inter-component capacitance
 - c) eliminating the effect of stray magnetic field
 - d) shielding the bridge element.
- viii) Which instrument cannot be used both for a.c. & d.c. measurements ?
- a) Dynamometer type b) Induction type
 - c) Electrostatic type d) Moving Iron type.
- ix) A virtual amplifier for a CRO can be designed for
- a) only a high gain
 - b) only a broad band
 - c) a constant gain time bandwidth product
 - d) all of these.
- x) Thermocouple instruments can be used for the frequency range
- a) Up to 100Hz b) Up to 5000 Hz
 - c) Up to 1 MHz d) 50 Hz and above.

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- xi) The term "Lissazous pattern" is associated with
- a) CRO
 - b) Digital multimeter
 - c) Galvanometer
 - d) Thermocouple.
- xii) The advantage of the moving coil permanent magnet type instrument is
- a) low power consumption
 - b) no hysteresis loss
 - c) efficiency eddy current damping
 - d) all of these.
- xiii) Turns compensation is used in C.T. primary for the reduction of
- a) phase angle error
 - b) both ratio and phase angle errors
 - c) ratio error
 - d) none of these.
- xiv) The scale of PMMC instrument is
- a) uniform
 - b) cramped
 - c) cramped at the ends
 - d) none of these.

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GROUP - B

(Short Answer Type Questions)

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

2. Define the terms : Accuracy, Precision, Resolution, Speed of response & Relative limiting error.
3. How can you measure the phase difference between two sinusoidal signals using a CRO ?
4. What are the advantages and disadvantages of Induction type instruments ?
5. Explain the difference between the CT and PT.
6. What are the functions of Time-base generator in CRO ?
7. Explain how power factor can be measured for 3-phase circuit having a balanced star connected load.
8. Describe principle of measurement of high resistance by "Loss of charge" method.

GROUP - C

(Long Answer Type Questions)

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

9. a) What are the possible sources of error if the Wheatstone bridge is used to measure low resistance.
- b) Explain with the relevant circuit diagram, the principle of measurement of low resistance by Kelvin's double bridge. Show that the condition of balance is independent of the lead resistance. Up to what low value can it be measured ?
- c) Describe with a neat diagram, the Wien's bridge method for measurement of unknown frequency.

 $3 + 7 + 5$

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10. a) Write briefly about the construction of an electrodymanometer type instrument.
- b) Derive the torque equation of the instrument when an alternative current is passed through the coil.
- c) List the principle errors of this type of instrument.

5 + 7 + 3

11. a) Explain with a neat sketch the operating principle of Linear variable differential transformer (LVDT).
- b) What are the advantages and disadvantages of LVDT ?
- c) The output of an LVDT is connected to a 5V voltmeter through an amplifier of amplification factor 250. The voltmeter scale has 100 divisions and the scale can be read to 1/5th of a division. An output of 2 mV appears across the terminals of the LVDT when the core is displaced through a distance of 0.5 mm.

Calculate —

- i) the sensitivity of the LVDT
- ii) that of the whole setup
- iii) the resolution of the instrument in mm. 6 + 4 + 5

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12. a) What is Lissajous figure ?
b) How can voltage and frequency be measured from CRO ?
c) How voltage can be measured from ramp type DVM ?

3 + 6 + 6

13. a) State the two advantages and disadvantages of moving coil and moving iron instruments.

- b) Write the working principle of CRO with appropriate block diagram.

6 + 9

14. a) For what specific purpose are shunts used in an ammeter and multipliers are used in a voltmeters ?

- b) Why PMMC meter instruments can be used only for DC application ?

- c) Draw a sketch showing the constructional details of a PMMC ammeter and label the important parts therein.

Name the parts that help to produce —

i) deflecting torque

ii) restraining torque

iii) damping torque.

5 + 5 + 5

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15. Write short notes on any three of the following :

3 × 5

- a) Megger
 - b) Digital multimeter
 - c) Semiconductor strain gauge
 - d) Laboratory type (Compton's) D.C. potentiometer
 - e) Rectifier type of deflecting instruments
 - f) DC potentiometer.
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