2014

Electrical & Electronic Measurement

Alloted : 3 Hours *Full Marks : 70*

The figure in the margin indicate full marks.
ıdidates are required to give their answers in their own words as far as practicable

GROUP - A
(Multiple Choice Type Questions)

ıoose the correct alternatives for any ten of the following: 10x1=10

In measurement systems, which of the following static characteristics is/are desirable

a) Accuracy

b) Sensitivity

c) Reproducibility

d) All of the above

The high torque to weight ratio in an analog indicating instrument indicates

a) High friction loss

b) Low friction loss

c) Nothing as regards friction loss

d) d) None of the above

iii) A 1mA ammeter has a resistance of 100 ohms. It is to be converted to a 1 A ammeter. The value of shunt resistance is

a) 0.001 ohm

b) 0.1001 ohm

c) 100000 ohm

d) 100 ohm

iv) Maxwell's bridge can be used for measurement of inductance with

a) High Q factors

b) Very low Q factors

c) Medium Q factors

d) wide range of Q factor variations

v) Braking torque provided by the permanent magnet in an induction type energy meter can be changed by

a) Providing a metal shunt and shifting its position

b) Moving the position of the permanent magnet either away from or towards the centre of the disc

c) Both (a) and (b)

d) None of the above

vi) In a spring-controlled moving iron instruments, the scale is

a) uniform

b) medium valud resistance

c) cramped at lower end and extended at the upper end.

d) cramped at both lower and upper ends.

vii) The potentiometer is standardized for making it

a) Precise

b) accurate

c) Accurate and precise

d) accurate and direct reading

viii) Error due to the rmo-emf effects in a Wheatstone bridge can be eliminated by

a) Taking the readings as quickly as possible

b) By avoiding junctions of dissimilar metals

c) By using a reversing switch to change battery polarity

d) All of the above

ix) The loss of charge method is used for measurement of

a) High value capacitance

b) Low value inductance

c) Low value resistance

d) High value resistance

x) Murray loop test is used for location of

a) short circuit fault on a cable

b) ground fault on a cable

c) both (a) and (b)

d) open circuit fault.

xi) Which instrument has the highest frequency range with accuracy within reasonable limits

a) PMMC

b) Moving Iron

c) Electrodynamometer

d) Rectifier

xii) A null type instrument as compared to deflection type instruments has

a) Lower sensitivity

b) faster response

c) Higher accuracy

d) all of the above

GROUP - B
(Short Answer Type Questions)

Answer any *three* of the following. 3x5=15

2. What is phantom loading? Explain with an example how it is more advantageous than testing with direct loading. (5)

3. Derive the Torque equation for PMMC type instrument. (5)

4. Define Precision and accuracy Highly precised instrument need not be highly accurate. -Explain. (3+2)

5. The following 10 observations were recorded when measuring a voltage 41.7, 42.0, 41.8, 42.0,42.1, 41.9, 42.0, 41.9, 42.5, 41.8 volt. Find

   i) The Mean

   ii) The average deviation

   iii) standard deviation

   iv) probable error of one reading. (5)

6. Describe the functions of Guard Ring used for high resistance measurement. (5)

GROUP - C
(Long Answer Type Questions)

Answer any *three* of the following. 3x15=45

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

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

   c) Explain the principle of operation of a digital frequency meter.

   [7+(1+3)+4]

8. a) State the limitations of low resistance measurement. Describe the working of Kelvin double bridge with necessary calculation.

   b) How insulation resistance can be measured using loss of charge method? Discuss in brief.

   c) State the conditions for A.C bridge balance.

   [(2+6)+5+2]

9. a) Describe the process of capacitance measurement using De sauty's bridge and draw the relevant phasor diagram. State the limitations of this bridge.

   b) In an Anderson bridge for the measurement of inductance the arm AB consists of an unknown impedance with inductance L and R, a known variable resistance in arm BC, fixed resistance of 600Ω each in arms CD and DA, a known variable resistance in arm DE, and a capacitor with fixed capacitance of 1μF in the arm CE. The ac supply of 100 Hz is connected across A and C, and the detector is connected between B and E. If the balance is obtained with a resistance

of 400Ω in the arm DE and a resistance of 800Ω in the arm BC, calculate the value of unknown R and L.

   c) Indicate the name of two detectors used for AC Bridge.

   [(5+2)+6+2]

10. a) Derive the expression for deflection of a spring controlled electro-dynamometer type instrument.

    b) What is swamping resistance?

    c) A moving coil voltmeter has a resistance of 100Ω. The scale is divided into 150 equal divisions. When a potential difference of 1V is applied to the terminals of the voltmeter a deflection of 100 divisions is obtained. Explain how the instrument could be used for measuring up to 300 V.

    d) Calculate the value of *form factor* of the full wave rectifier type voltmeter calibrated in terms of rms value of a sinusoidal wave.

    (6+2+4+3)

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

    (3X5)

    a) LVDT

    b) Potentiometer

    c) Digital Multimeter

    d) Strain gauge

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