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**END SEMESTER EXAMINATION – 2022**

Semester : 4th

Subject Code : EI- 403

**ELECTRICAL MEASUREMENTS AND  
MEASURING INSTRUMENTS-I**

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks  
for the questions.

**Instructions :**

1. All questions of PART – A are compulsory.
2. Answer any five questions from PART – B.

**PART – A**

Marks – 25

1. Fill in the blanks : 1×10=10
  - (a) Units of length, mass and time are called primary fundamental units.
  - (b) The accuracy of an instrument is measured in terms of true value.

[Turn over

(c) Sensitivity is a static characteristic of an instrument.

(d) To get the pointer of an instrument at its final position deflection torque should be equal to controlling torque.

(e) Kelvin's double bridge is used to measure unknown resistance.

(f) The deflection of a pointer in an indicating instrument is due to magnetic effect.  
(g) factor is measured by Hay's bridge.

(h) A Potentiometer is basically a Null instrument.

(i) Brook's deflectional potentiometer is used when the unknown voltage is continuously changing.

(j) The range of an ammeter can be increased by connecting a suitably low resistance parallel to the ammeter.

2. Write True or False :  $1 \times 10 = 10$

(a) Energy meter is an integrating instrument. T

(b) Moving iron instrument has a square law response. F

(c) Ratio error is due to iron loss. T

(d) Lag is a static characteristic. F

(e) Magnetising component creates phase angle error. F

(f) Insulation resistance can be measured by Wheatstone bridge. F

(g) All electrostatic instruments are used to measure voltage. T

(h) CTs are used to measure alternating current. T

(i) Maxwell's Inductance-Capacitance bridge has low quality factor. F

(j) Weins bridge is used to measure frequency. T

3. Choose the correct answer :  $1 \times 5 = 5$

(a) The base units in S.I system are

(i) Metre, kilogram, second

(ii) Metre, kilogram, second, ampere

(iii) Metre, kilogram, second, ampere, kelvin, candela, mole

(iv) Metre, kilogram, second, ampere, kelvin, candela

(b) The relative damping in a galvanometer is 0.8, its logarithmic decrement is approximately

(i) 0.48

(ii) 1.25

(iii) 4.19

(iv) -4.19

(c) Swamping resistance is connected

- (i) In series with the shunt to reduce temperature error in shunted ammeters
- (ii) In series with the shunt to reduce errors on account of friction
- (iii) In series with the meter and have a negligible resistance co-efficient in order to reduce temperature errors in shunted ammeters.
- (iv) None of the above

(d) From the point of view of safety, the resistance of earthing electrode should be

- (i) low (ii) high
- (iii) medium (iv) None of these

(e) In D'Sauty's Bridge it is

- (i) Possible to obtain balance even if both the capacitors are imperfect
- (ii) Possible to obtain balance if one of the capacitors is perfect.
- (iii) Possible to obtain balance only if both the capacitors is perfect
- (iv) All of the above.

### PART- B

Marks - 45

- 4. (a) Derive dimensions of Resistance and Current. 4
- (b) A Kelvin bridge is balanced with the following constants : 5  
Outer ratio arm  $100\Omega$  and  $1000\Omega$ , Inner arms, ratio  $99.92\Omega$  and  $1000.6\Omega$ , Resistance of link,  $0.1\Omega$  and standard resistance,  $0.00377\Omega$ . Calculate the value of unknown resistance.
- 5. (a) Explain the construction and working principles of a PMMC instruments. 5
- (b) Discuss the reasons of the following errors in an instrument and also state how to mitigate them in a moving iron instruments : Hysteresis errors and Temperature error. 4
- 6. (a) Derive the equations for balance in the case of Maxwell's inductance capacitance bridge. 5
- (b) Describe the basic principle of operation of a D.C potentiometer. Explain why a potentiometer does not load the voltage source whose voltage is being determined. 4

7. (a) Describe the construction and working principles of meggar. 5  
(b) State the advantages and disadvantages of a meggar. 4
8. (a) Define the terms : 'Indicating instruments' and 'Integrating instruments' 4  
(b) Explain the construction and working principles of a moving coil instrument. 5
9. (a) How do you extend the ranges of ammeter and voltmeters using shunt and multipliers ? 5  
(b) Explain the working principles of a electrostatic voltmeter. 4
10. Write short notes on : 9  
(i) Wheatstone bridge  
(ii) Moving iron instruments.