Total number of printed pages: 02

D/5th Semester/DIE503

2023

ELECTRICAL AND ELECTRONIC MEASUREMENTS

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1. a) What is the difference between an indicating and integrating instrument? What are the different principles of operation of measuring instruments? Describe each of them. 2+8=10

   b) Explain how d'Arsonval type galvanometer works? 6

   c) A moving coil instrument has a coil of coil of dimensions 20 mm x 15 mm. The flux density in the air gap is 1.8×10^{-3} Wb/m^2 and the spring constant is 0.1×10^{-6} Nm/rad. Determine the number of turns required to produce an angular deflection of 60 degrees when a current of 5 mA is flowing through the coil. 4

2. a) Describe the constructional details and the working principle of single phase induction type energy meter. What are the advantages and disadvantages of single phase induction type energy meter? 7+2=9

   b) How does a galvanometer function as an ammeter and voltmeter? With the help of circuit diagram, derive the expression of multiplying factor of an ammeter. 4+3 = 7

   c) A moving-coil instrument whose resistance is 25 Ω gives a full-scale deflection with a voltage of 25 mV. This instrument is to be used with a series multiplier to extend its range to 10 V. Calculate the error caused by 10°C rise in temperature. The temperature coefficient of copper is 0.004/°C and that of manganin is 0.00015/°C 4

3. a) Which bridge is suitable for medium resistance measurement and which one for low resistance measurement? With the help of circuit diagram, obtain the unknown value of resistance using Kelvin's double bridge. 2+6=8

   b) What do you mean by leakage resistance of a material? Explain how does a megger work in the measurement of high resistance? 1+5=6

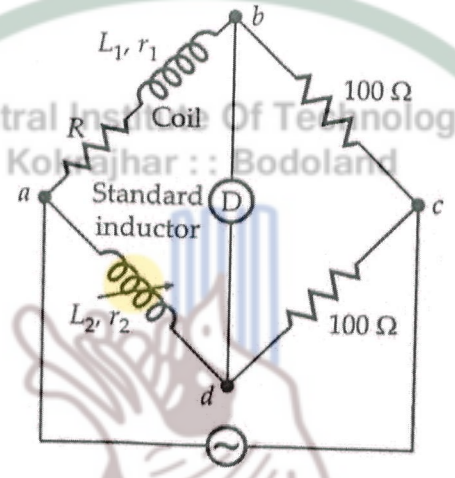
   c) How ammeter-voltmeter method can give resistance measurement? What 4+2=6

kind of error is observed in ammeter-voltmeter method?

4. a) Derive the expression of unknown inductance of Hay's bridge. Also draw the phasor diagram of the currents and voltages. 5+2=7

b) Which parameter can be obtained using De Sauty's bridge? Derive the value of unknown capacitance using Schering bridge. 1+6=7

c) A Maxwell's capacitance bridge as shown below is used to measure an unknown inductance in comparison with capacitance. The various values at balance, R_{bc} = 100 Ω; R_{cd} = 100 Ω; r_2=32.7 Ω; L_2= 47.8 mH and R= 1.36 Ω. Calculate the values of r_1 and L_1. 6



5. a) How does the mutual inductance of coils can be determined by a bridge circuit? Also draw the phasor diagram. 6+2=8

b) Write about a method for the measurement of unknown frequency. 6

c) Explain how an electronic voltmeter works? What is the advantage of electronic voltmeter over regular electromagnetic voltmeter? 5+1=6

6. a) How a very low current can be measured by an electronic ammeter? Explain the working of a digital voltmeter. 2+6=8

b) With the help of block diagram, explain the function of the components of a cathode ray tube. 12

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