



- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

1. a) Derive an expression for bridge sensitivity for a Wheatstone bridge in terms of bridge voltage, bridge parameters & the voltage sensitivity. **6**
- b) Three arms of Wheatstone bridge have resistance of  $100 \Omega$  & fourth arm of  $100.01 \Omega$  A galvanometer of  $50 \Omega$  resistance &  $0.05 \mu A/mm$  of sensitivity is connected across one diagonal of the bridge. A battery of 3 V e.m.f is connected in series with a resistance of  $200 \Omega$  to the other diagonal find the deflection in the galvanometer. **7**

**OR**

2. a) Derive the expression for unknown capacitance and its internal resistance when measured by Schering bridge. Draw the phasor diagram. **6**
- b) Arms of bridge are as follows. **7**  
AB = coil of unknown impedance (R & L series)  
BC = Pure resistor of  $1000 \Omega$ .  
CD = Pure resistor of  $833 \Omega$  in series with a capacitor of  $0.38 \mu f$   
DA = Pure resistor of  $16800 \Omega$   
If the supply frequency of  $50 Hz$  then determine unknown inductance & resistance of the coil at balance condition. Draw phasor diagram.

3. a) Derive the torque equation for permanent magnet moving coil instrument. **4**
- b) List advantages & disadvantages of moving iron instrument. **4**
- c) Explain construction and working of attraction type moving iron instrument. **6**

**OR**

4. Write short notes on.
- a) Power factor meter **7**
- b) Frequency meter **6**

5. a) Explain the working of single phase Induction type watt hour meter with neat sketch. shown that disc revolution is proportional to the electric energy supplied to meter. 7
- b) Two wattmeters connected to measure the input to a balanced 3  $\phi$  circuit indicate 2000 watt & 500 watt respectively find the power factor of circuit. 6
- i) When both the readings are positive
- ii) When the later reading is obtain after reversing the connection to the circuit coil of first instrument.

**OR**

6. a) Define the following terms in connection with instrument transformer 6
- i) Ratio correction factor
- ii) Phase angle error in CT
- b) A 1000/5A, 50Hz current transformer has a secondary burden comprising a non inductive impedance of  $1.6\Omega$  The primary winding has one turn calculate the flux in the core & ratio error at full load. Neglect leakage reactance & assume iron loss in the core to be 1.5 w at full load. The magnetizing mmf is 100 A 7
7. a) Explain the Gaussian curve of error distribution & hence define probable error. 7
- b) Define error. What are the different types of errors in instrumentation system. Explain them in detail & suggest remedies for it. 6

**OR**

8. a) Explain digital data acquisition system (DAS). 6
- b) Draw & explain diagram giving an elementary idea of microprocessor based instrumentation. 7
9. a) List the various methods used for vibration measurement & explain any one in detail. 6
- b) Explain the construction and working of L.V.D.T. 7

**OR**

- 10 a) Explain stroboscope accelerometer in detail. 6
- b) Derive the equation for gauge factor 7
- $$G_f = 1 + 2V + \frac{\delta R / R}{\delta L / L} .$$
- Where
- V = Poisson Ratio
- R = resistance of material
- L = Length of material

11. a) Explain capacitive type strain gauge used as pressure sensor. 7
- b) Write short note on **any two**. 7
- a) McLeod gauge
- b) Thermal conductivity gauge
- c) Ionization gauge

**OR**

12. Write short note on
- i) Resistance temperature detector (RTD) 7
- ii) Flow measurement using ultrasonic flow meter. 7

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