B.E. Third Semester (Electrical Engineering (Electronics & Power)) (C.B.S.)

Electrical Measurements & Instrumentation

P. Pages : 2 **NKT/KS/17/7224**

Time : Three Hours * 0 2 7 3 * Max. Marks : 80

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. Illustrate your answers whenever necessary with the help of neat sketches.
9. Use of non programmable calculator is permitted.

1. a) Describe a method which overcome the errors in the measurement of low resistance. **6**

b) The four arms of a bridge are : **7**

AB - unknown inductance L_1 with internal resistance R_1.

BC - 100Ω pure resistance

CD - Capacitor of $0.1\mu f$

DA - resistance of 834Ω in series with a capacitor $0.124\mu f$ capacitance.

A supply of 2 KHz is given between point A and C and a detector is connected between B and D. Derive balance condition and calculate impedance of branch AB. Also draw phasor diagram for the bridge.

OR

2. a) Explain the suitable bridge for measurement of self inductance having quality factor Q > 10. Draw the phasor diagram. **7**

b) In the Wheatstone's bridge the values of resistance of various arms are $P = 1000\Omega$, $Q = 100\Omega$, $R = 2005\Omega$ and $S = 200\Omega$. The battery has an emf of 5V and negligible internal resistance. The galvanometer has a current sensitivity of $100\,mm/\mu A$ and internal resistance of 100Ω. Calculate the deflection of galvanometer and sensitivity of bridge in terms of deflection per unit change in resistance. **6**

3. a) Why moving coil type instruments cannot be used on ac? State the modifications required so that it can be used on ac. **3**

b) A moving coil instrument has a resistance of 20Ω and takes 50 mA for full scale deflection. Explain how it can be used as : **4**

i) an ammeter of range 50 A. ii) a voltmeter to read upto 1000V.

c) Write short note on Power factor meter. **6**

OR

4. a) Derive the torque equation for repulsion type moving iron instruments. **6**

b) Write short note on Synchronoscope. **7**

5. a) State and prove Blondel's theorem. **6**

b) A current transformer of turns ratio 1 : 199 is rated as 1000/5A, 25VA. The core loss and magnetizing component of the primary current are 4A and 7A under rated conditions. Determine the phase angle and ratio errors for the rated burden and rated secondary current at 0.8 pf lagging and 0.8 pf. leading. Neglect the resistance and leakage reactance of secondary winding. **7**

OR

6. a) Why is CT secondary never kept open circuited? **4**

b) The number of revolution per kwh for 230V, 10A watthour meter is 900. On test at half load, the time for 20 revolutions of disc is found to be 69 sec. Determine the meter error at half load. Assume that the low power factor is unity. **4**

c) The two wattmeter readings for two wattmeter method are 5 kw and 0.5 kw. Calculate power and power factor of the load when the latter reading being obtained after reversal of the current coil connection. **5**

7. a) Explain generalised instrumentation system with suitable example. **7**

b) Discuss in detail digital data acquisition system. **7**

OR

8. a) Differentiate between : **6**

i) Active and Passive transducer.

ii) Primary and Secondary transducer.

b) Explain the following characteristics of instruments : **8**

i) Drift ii) Sensitivity

iii) Threshold iv) Accuracy

9. a) Explain construction and working of LVDT. **7**

b) What is piezo-electric effect? How it can be used for measurement of acceleration? **6**

OR

10. a) Derive the expression for gauge factor of a strain gauge. **6**

b) Explain seismic instruments as accelerometer. **7**

11. a) Write short notes on **any two.** **8**

1) Laws of thermoelectric circuit.

2) Venturi Tube

3) Hot Wire Anemometer.

b) Explain in detail any one method used for measurement of low pressure. **6**

OR

12. a) Explain working of electromagnetic flowmeter. **6**

b) Distinguish between temperature measurement using RTD and thermistor. **4**

c) A copper resistor has resistance of 100Ω at 25ºC. Find the resistance at 65ºC if the copper has resistance temperature coefficient of 0.00393/ºC. **4**

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