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

Electrical Measurements & Instrumentation Paper – III

P. Pages : 2 **TKN/KS/16/7312**

Time : Three Hours 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. 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.

1. a) Define loading effect of instrument. Explain loading effects due to shunt connected instruments. Illustrate your answer suitably. **7**

b) In the Wheatstone bridge, the values of resistance of various arms are P = 1000Ω, Q = 100Ω, R = 2005Ω & S = 200Ω. The battery has an emf of 5V and negligible internal resistance. The galvanometer has a current sensitivity of 10mm/μA and an internal resistance of 100Ω. Calculate the deflection of galvanometer and the sensitivity of bridge in terms of deflection per unit change in resistance. **7**

OR

2. a) Explain Schering's bridge with phasor diagram. Derive an expression to kind unknown capacitance. What are its advantages and limitations. **7**

b) The four arms of a.c. bridge are arranged as follows: **7**
AB : - A coil of unknown impedance.
BC : - Non-inductive resistor of 1000Ω.
CD :- Non-inductive resistor of 833Ω in series with a standard capacitor of 0.38 μF.
DA : - Non inductive resistor of 16800 Ω.
If supply frequency is 50 Hz, derive and determine the inductance and resistance of arm AB at balance condition.

3. a) Explain construction and working of PMMC instrument. **6**

b) The inductance of attraction type instrument is given by $L = \left(10 + 5\theta - \theta^2\right)\mu H$ where θ is the deflection in radians from zero position. The spring constant is 12×10^{-6} N-m/rad. Find out deflection for a current of 5A. **4**

c) What are advantages and limitations of moving iron instruments. **3**

OR

4. a) Derive torque equation for dynamometer type instruments. **7**

b) Explain construction and working of power factor meter. **6**

5. a) Two wattmeters connected to measure the input to a balanced 3 phase circuit indicate 2000W and 500W respectively. find the power factor of the circuit. **6**
   i) When both the readings are positive.
   ii) When the latter reading is obtained after revasing the connections to the current coil of the first instrument.

   b) Explain the working of dynamometer type instrument as wattmeter. Derive an expression for deflecting torque when used in ac circuit. **7**

OR

6. a) A 1000/5A, 50 Hz, current transformer has a secondary burden comprising of a non inductive impedance of 1.6 Ω. The primary winding has one turn. Calculate the flux in the core and ratio error at full load. Neglect leakage reactance and assume the iron loss in the core to be 1.5 W at full lond. The magnetizing mmf is 100A. **9**

   b) Define the following. **4**
   i) Transformation ratio. ii) Nominal ratio.

7. a) Explain static and dynamic characteristics of instruments. **8**

   b) Explain with the help of block diagram a generalised instrumentation system. **6**

OR

8. a) Explain with block diagram digital data acquisition system. **6**

   b) A circuit was tuned for resonance by eight different trainee engineers and the value of resonant frequency in KHz was recorded as 532, 548, 543, 535, 546, 531, 543 and 536. Calculate. **8**
   i) Arithmetic mean. ii) The average deviation.
   iii) The standard deviation. iv) Deviation from mean.
   v) Variance.

9. a) Explain the construction and working of L. V. D. T. **7**

   b) What is gauge factor? Prove that the gauge factor $= 1 + 2\nu + \dfrac{\Delta\rho/\rho}{\Delta L/L}$ **6**

   where ν = Poisson's ratio.
   ρ = resistivity.
   L = Length.

OR

10. a) What is piezo electric effect? Explain piezoelectric type accelerometer. **7**

   b) Explain one method each for measurement of linear and angular velocity. **6**

11. a) Explain various laws of thermoelectric circuits. **6**

   b) Explain total radiation pyrometer. **7**

OR

12. a) What do you mean by low pressure? Discuss various methods for measurement of low pressure. Explain any one. **7**

   b) Describe the construction and working of resistance thermometers. **6**

****