B.E. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester-IV
SE204 - Measurements and Instrumentation

P. Pages : 2

Time : Three Hours

Max. Marks : 80

———

Notes :
1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Diagrams and Chemical equation should be given wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Discuss the reaction, mechanism wherever necessary.
7. Read the questions paper carefully (Branch, Semester, Scheme) before attempting the questions.
8. Every questions carry identical marks.
9. Answer five questions as per given internal choice.
10. Use of programmable calculator is prohibited.
11. Don't use red pen for writing the answers.
12. Don't write any other comments except answers of questions.

1. a) Explain construction and working of electrodynamometer type instrument. **8**

b) The inductance of MI type ammeter instrument with full scale deflection of 90° at 1.5A is given by $L = (200 + 40\theta - 4\theta^2 - \theta^3)\mu H$, where θ is the deflection in radians from zero position. Estimate the angular deflection of the pointer for a current of 1.0 A. **8**

<div align="center">OR</div>

2. a) Describe the working of a universal shunt for multi-range ammeters. Derive expressions for resistances of different sections of a universal shunt used for a 3 range ammeter. **8**

b) Explain the shape of scale in moving iron type instruments with expression. **8**

3. a) What are capacitive transducers? State its advantages and disadvantages. **8**

b) The following 10 observations were recorded when measuring a voltage 41.7, 42.0, 41.8, 42.0, 42.1, 42.0, 41.9, 42.5, 41.8 Find: **8**
1) The mean,
2) The standard deviation,
3) Range
4) The probable error of one reading,
5) The probable error of mean and

<div align="center">OR</div>

4. a) Explain the with neat sketch the generalized instrumentation system with practical example. **8**

b) Write a short note on: **8**
i) Piezo Electric Transducer
ii) Semiconductor strain gauge
iii) Histogram
iv) Standard deviation

5. a) Explain with phasor diagram and expression, the method for measurement of active power in three phase circuit using one wattmeter. **8**

b) The power flowing in a 3 phase 3 wire balanced load system is measured by two wattmeter method. The reading of wattmeter A is 7500 W and wattmeter B is – 1500 W. **8**
   i) What is the power factor of the system?
   ii) If the voltage of the circuit is 400 V, what is the value of capacitance which must be introduced in each phase to cause whole of the power measured to apply on wattmeter A? The frequency is 50 Hz.

OR

6. a) Explain the term creeping in energy meter? How it can be prevented? **8**

b) A 230 V, signal phase energy meter has a constant load of 4 A passing through it for 6 hours at unity power factor. If the meter disc makes 2208 revolutions during this period what is the meter constant in revolutions per kWh? Calculate the power factor of the load if the number of revolutions made by the meter are 1480 when operating at 230V and 5A for 4 hours. **8**

7. a) Derive an expression for the unknown resistance measured using the loss of charge method. **8**

b) State different methods used for measurement of medium resistances and explain any one method of medium resistances measurement. **8**

OR

8. a) Drive an expression for balanced Hay's bridge for the measurement of inductance and draw the phasor diagram under balanced condition. **8**

b) A 4 terminal resistor of approximately $50\,\mu\Omega$ resistance was measured by means of a Kelvin Double bridge having the following components: **4**
   Standard resistor = $100.02\,\mu\Omega$; Inner ratio arms = $100.022\,\Omega$ and $199\,\Omega$; Outer ratio arms = $100.025\,\Omega$ and $200.46\,\Omega$; resistance of link connecting the standard and the unknown resistance = $300\,m\Omega$. Calculate value of the unknown resistance.

c) Write a short note on modified De-Sauty's Bridge. **4**

9. a) Describe the method for measurement of temperature with use of- **10**
   i) RTDS
   ii) Thermistors and
   iii) IC sensor
   Describe their advantages and disadvantages.

b) Name different elastic pressure element and give their useful working range and other characteristics. **6**

OR

10. a) What are the errors that occurs during the measurement using thermocouple? **4**

b) Explain single phase power measurement in a high voltage system using instrument transformer with suitable circuit diagram. **8**

c) Why the secondary winding of a CT should never be open circuited with its primary still energized. **4**

****