

GUJARAT TECHNOLOGICAL UNIVERSITY

DI - SEMESTER – OLD PAPER – S22 TO S25 – QUESTION BANK(English)

Subject Name & Code:

Electrical Instrumentation- 4330902

Unit I - Fundamentals of Measurement and Instrumentation

Repeated Questions:

1. **Explain the generalized system of measurement with a block diagram.**
 - Appeared in: SUM 23 (Q1b, 04 marks), WIN 23 (Q2a, 03 marks)
2. **Define the terms: (1) Range (2) True Value (3) Error.**
 - Appeared in: SUM 23 (Q2b, 04 marks - Any Two), WIN 23 (Q1a, 03 marks), SUM 25 (Q4a, 03 marks)
3. **Define/Explain the difference between Accuracy and Precision.**
 - Appeared in: WIN 24 (Q1, 03 marks), SUM 25 (Q1b, 04 marks)
4. **Explain the role of an instrument in a measuring system.**
 - Appeared in: SUM 24 (Q4a-OR, 03 marks), WIN 24 (Q1b, 04 marks)
5. **State different types of damping methods. Explain eddy current damping with a diagram.**
 - Appeared in: SUM 24 (Q2a-OR, 03 marks), SUM 25 (Q1c, 07 marks)
6. **Define/Explain the terms: Sensitivity, Resolution, and Threshold.**
 - Appeared in: SUM 24 (Q3a, 03 marks), WIN 22 (Q1a, 03 marks)

Other Important Questions:

7. Define the terms: Repeatability. (WIN 23 - Q1a, 03 marks)
8. Define the term: Calibration. (SUM 23 - Q2b-OR, 04 marks)
9. Define the term: Span. (SUM 23 - Q2b, 04 marks)
10. Define the term: Indicated Value. (SUM 23 - Q2b, 04 marks)
11. State the common errors in electromechanical instruments and define any two of them. (SUM 23 - Q1c, 07 marks)
12. Explain Fluid friction damping. (SUM 24 - Q2a-OR, 03 marks)
13. Find the resolution if a voltmeter with a range of 0-1000 V has 500 scale divisions. Each division can be read up to half a division. (SUM 24 - Q3a-OR, 03 marks)
14. A voltmeter with a range of 0-999 count. Find the resolution when the full-scale reading is 0.99 V. (SUM 24 - Q4a, 03 marks)
15. State the various types of bridges. Also state the advantages of bridge circuits. (WIN 22 - Q4a, 03 marks)
16. Give the classification of electromechanical instruments based on the principle of operation. (WIN 24 - Q3a, 03 marks)
17. List out points to be considered while selecting a measuring instrument. (WIN 24 - Q3b, 04 marks)
18. Define Error and explain sources of error in measurement. (WIN 24 - Q1c, 07 marks)
19. Compare gravity control with spring control. (SUM 25 - Q1a, 03 marks)
20. Explain the torque required for the operation of indicating type instruments. (SUM 24 - Q2a, 03 marks)
21. State the different types of torques in electromechanical instruments and explain deflecting torque. (WIN 22 - Q1b, 04 marks)
22. Explain the spring control system to produce controlling torque in electromechanical instruments. (WIN 23 - Q1b, 04 marks)

Unit II - Potentiometers and Bridges

Repeated Questions:

1. **Explain the principle of a potentiometer.**
 - Appeared in: WIN 22 (Q2a, 03 marks), WIN 23 (Q2a-OR, 03 marks), SUM 25 (Q2a-OR, 03 marks)
2. **Explain Kelvin's Double Bridge for the measurement of low resistance.**
 - Appeared in: SUM 23 (Q3c-OR, 07 marks), WIN 23 (Q1c, 07 marks), SUM 25 (Q2c, 07 marks)
3. **Explain the construction and working of a Megger with a diagram.**
 - Appeared in: WIN 22 (Q2c-OR, 07 marks), WIN 23 (Q1c-OR, 07 marks), SUM 25 (Q2c-OR, 07 marks)
4. **Explain Maxwell's Bridge.**
 - Appeared in: WIN 22 (Q2b-OR, 04 marks), WIN 23 (Q2c, 07 marks), SUM 25 (Q2b-OR, 04 marks)
5. **Explain Wien's Bridge.**
 - Appeared in: SUM 24 (Q3b, 04 marks), WIN 23 (Q2c-OR, 07 marks)

Other Important Questions:

6. Explain Wheatstone bridge for the measurement of resistance. (WIN 22 - Q2b, 04 marks)
7. Derive the formula to measure small value resistance using Kelvin's double bridge. (WIN 22 - Q2c, 07 marks)
8. Write steps for the standardization of a dual-range potentiometer. (WIN 22 - Q2a-OR, 03 marks)
9. List any four applications of a D.C. potentiometer. (SUM 23 - Q3b, 04 marks)
10. Prove that the scale of a Dynamometer type instrument is not uniform. (SUM 23 - Q3a, 03 marks)
11. Explain the construction and working of a Wheatstone bridge. (SUM 23 - Q3c, 07 marks)
12. Compare CT and PT. (SUM 23 - Q3a-OR, 03 marks)
13. List the types of A.C. bridges (Any four). (SUM 23 - Q3b-OR, 04 marks)
14. A potentiometer is balanced at a length of 55 cm when used with a standard cell of emf 1.0185 volts. Determine the value of the unknown emf of a battery when the balance is obtained at 90 cm. (SUM 23 - Q4b, 04 marks)
15. A Wheatstone bridge circuit has ratio arms of values 15 Ohms and 5 ohms. The standard variable resistance is set to 10 Ohms. Determine the value of the unknown resistance under the balance condition. (SUM 23 - Q4b-OR, 04 marks)
16. Explain Desauty's bridge and derive its equation. (SUM 24 - Q1b, 04 marks)

17. Explain Anderson's bridge and derive its equation. (SUM 24 - Q2b, 04 marks)
18. Explain Owen's bridge and derive its equation. (SUM 24 - Q2b-OR, 04 marks)
19. Explain Hay's bridge and derive its equation. (SUM 24 - Q3b-OR, 04 marks)
20. Explain Maxwell-Wien bridge and derive its equation. (SUM 24 - Q4b, 04 marks)
21. List out applications of a potentiometer and explain any one in detail. (WIN 23 - Q2b-OR, 04 marks)
22. Explain the measurement of frequency using Wien's bridge. (WIN 23 - Q2c-OR, 07 marks)
23. Explain the calibration of a voltmeter using a potentiometer. (WIN 22 - Q4b, 04 marks)
24. Explain the application of a potentiometer to measure higher voltage. (WIN 24 - Q1, 03 marks)
25. List out precautions to be taken while using a potentiometer. (WIN 24 - Q1, 03 marks)
26. Explain the measurement of high voltage using a potentiometer. (SUM 25 - Q2b, 04 marks)
27. Denote the formula to measure unknown inductance using Maxwell's bridge. (WIN 24 - Q1, 03 marks)
28. Dense the formula to measure unknown capacitance using Wien bridge. (WIN 24 - Q1, 03 marks)

Unit III - Electromechanical Instruments

Repeated Questions:

1. **Compare Moving Iron (MI) and PMMC type instruments.**
 - Appeared in: WIN 23 (Q3a, 03 marks), SUM 24 (Q1c, 07 marks)
2. **Explain the construction and working of a single-phase induction type energy meter.**
 - Appeared in: SUM 23 (Q3c-OR, 07 marks), WIN 23 (Q3c-OR, 07 marks), WIN 24 (Q3c, 07 marks)
3. **Explain the construction and working of a Clip-on meter.**
 - Appeared in: SUM 23 (Q2c, 07 marks), WIN 23 (Q4a, 03 marks), WIN 24 (Q4c-OR, 07 marks)
4. **What is an instrument transformer? Compare between Current Transformer (CT) and Potential Transformer (PT).**
 - Appeared in: SUM 23 (Q3a-OR, 03 marks), WIN 22 (Q3c, 07 marks)
5. **Explain the construction and working of a Moving Iron Repulsion type instrument.**
 - Appeared in: WIN 23 (Q3c, 07 marks), SUM 24 (Q5a, 03 marks)
6. **Explain the use of a shunt to extend the range of an ammeter. / Derive the formula for shunt resistance used to extend the range of an ammeter.**
 - Appeared in: WIN 23 (Q3b-OR, 04 marks), SUM 25 (Q3c, 07 marks)

Other Important Questions:

7. State the advantages of a PMMC meter. (SUM 23 - Q1c-OR, 07 marks)
8. Explain the construction and working of an MI instrument. (SUM 23 - Q2c-OR, 07 marks)
9. Explain the construction and working of a PMMC Type Ammeter with a diagram. (WIN 22 - Q3b, 04 marks)
10. What is Shunt and series multiplier? (WIN 22 - Q3c, 07 marks)
11. Explain the construction and working of a Hot wire Instrument. (WIN 22 - Q3a-OR, 03 marks)
12. Explain the construction and working of an MI type attraction Ammeter. (WIN 22 - Q3b-OR, 04 marks)
13. Write a short note on a universal impedance bridge. (WIN 22 - Q3a, 03 marks)
14. Draw a block diagram of a single-phase solid-state energy meter and explain its working. (WIN 22 - Q3c-OR, 07 marks)
15. Explain the working of a dynamometer type wattmeter with a diagram. (SUM 25 - Q3b, 04 marks)
16. Give the difference between PMMC and Dynamometer type ammeter. (SUM 25 - Q3a-OR, 03 marks)

17. Write a short note on a Multimeter. (SUM 25 - Q3b-OR, 04 marks)
18. Explain Moving Iron Attraction type Instrument. (SUM 24 - Q5a-OR, 03 marks)
19. Explain the construction and working of a rotating type phase sequence indicator with a diagram. (WIN 23 - Q3a-OR, 03 marks)
20. Explain the construction and working of a Merz price maximum demand indicator with a diagram. (WIN 23 - Q3b, 04 marks)
21. Explain the connections of CT and PT for an instrument transformer with a necessary diagram. (WIN 24 - Q3b-OR, 04 marks)
22. Explain a thermal type maximum demand indicator with a necessary diagram. (WIN 24 - Q3c-OR, 07 marks)
23. List out advantages of a tri-vector meter. (WIN 24 - Q3a-OR, 03 marks)
24. State the advantages and disadvantages of moving iron type instruments. (SUM 25 - Q2c-OR, 03 marks)
25. Prove that the scale of a Dynamometer type instrument is not uniform. (SUM 23 - Q3a, 03 marks)

Unit IV - Calibration and Testing

Repeated Questions:

1. **Explain the calibration of an ammeter.**
 - Appeared in: SUM 23 (Q2a-OR, 03 marks), WIN 23 (Q4b, 04 marks), WIN 24 (Q4a, 03 marks)
2. **Explain the calibration/testing of a single-phase energy meter.**
 - Appeared in: SUM 23 (Q4b-OR, 04 marks), WIN 23 (Q4b-OR, 04 marks), SUM 25 (Q4c-OR, 07 marks)
3. **Explain the necessity of calibration.**
 - Appeared in: SUM 23 (Q2a-OR, 03 marks), SUM 25 (Q4b-OR, 04 marks)
4. **Write the general test conditions as per I.S. for calibration of electrical instruments (Ammeter, Voltmeter, Wattmeter).**
 - Appeared in: SUM 23 (Q2a, 03 marks), WIN 22 (Q3b, 04 marks), SUM 24 (Q5b, 04 marks)

Other Important Questions:

5. Explain the calibration of a voltmeter using a substandard meter. (SUM 23 - Q1a, 03 marks)
6. Explain the calibration of a Wattmeter as per Indian standard. (SUM 25 - Q4b, 04 marks)
7. Explain the calibration of a wattmeter using a potentiometer. (WIN 24 - Q4b-OR, 04 marks)
8. Explain any one method for the testing of an energy meter. (WIN 24 - Q4b, 04 marks)
9. A single-phase energy meter calibrated by a substandard wattmeter gives the following results. Disc revolution = 30, Required time = 19.5 second, Wattmeter reading = 4500 W, Meter constant = 1200 Revolution/kWh. Find the error percentage and conclude that the meter is running fast or slow. (SUM 24 - Q5b-OR, 04 marks)
10. The full-scale deflection of a moving coil Ammeter is 100mA. The internal resistance of the meter is 2 Ohms. To measure up to 20 Amp. with the same meter, find the value of shunt resistance to be used. (SUM 23 - Q5b, 04 marks)
11. The full-scale deflection of a moving coil instrument is 1mA. The internal resistance of the meter is 2 Ohms. To measure up to 5 volts with the same meter, find the value of series resistance to be used. (SUM 23 - Q5b-OR, 04 marks)
12. Explain the calibration of an ammeter using a potentiometer. (SUM 25 - Q1c-OR, 07 marks)

Unit V - Transducers

Repeated Questions:

1. **Explain the construction and working of an LVDT.**
 - Appeared in: WIN 22 (Q1c, 07 marks), WIN 23 (Q5c, 07 marks), WIN 24 (Q4c, 07 marks)
2. **Explain the construction and working of a Photo Diode.**
 - Appeared in: WIN 22 (Q1c-OR, 07 marks), WIN 24 (Q5c, 07 marks), SUM 25 (Q5c, 07 marks)
3. **Explain the construction and working of an RTD. / Explain the measurement of temperature using an RTD.**
 - Appeared in: SUM 23 (Q5c, 07 marks), WIN 23 (Q5c-OR, 07 marks), WIN 24 (Q5c, 07 marks)
4. **Explain a Piezoelectric transducer.**
 - Appeared in: WIN 22 (Q5b, 04 marks), WIN 23 (Q5b, 04 marks), WIN 24 (Q5a, 03 marks)
5. **State the types of transducers used for the measurement of Displacement and explain any one.**
 - Appeared in: WIN 22 (Q5c, 07 marks), WIN 24 (Q5b-OR, 04 marks), SUM 25 (Q5a-OR, 03 marks)
6. **Explain the factors to be considered in the selection of a transducer.**
 - Appeared in: WIN 22 (Q5a, 04 marks), WIN 24 (Q5b, 04 marks)

Other Important Questions:

7. List any three transducers used for the measurement of Pressure. (SUM 23 - Q4a, 03 marks)
8. List any three characteristics of transducers. (SUM 23 - Q5a, 03 marks)
9. List any three errors of transducers. (SUM 23 - Q5a-OR, 03 marks)
10. Describe the method to measure the displacement using a photoelectric transducer. (SUM 23 - Q5c-OR, 07 marks)
11. Explain the construction and working of a thermocouple with its application. (SUM 23 - Q4c, 07 marks)
12. State any three advantages of a Thermistor. (SUM 23 - Q4a-OR, 03 marks)
13. Explain the Optical transducer and Photoelectric effect. (SUM 24 - Q2c, 07 marks)
14. Explain the usage of Capacitive Transducers. (SUM 24 - Q2c-OR, 07 marks)
15. Explain Variable reluctance transducer and Selsyn. (SUM 24 - Q3c, 07 marks)
16. Explain Variable permeance transducer and RVDT. (SUM 24 - Q3c-OR, 07 marks)
17. What is a Resistive transducer and explain a Mechanically varied resistance potentiometer? (SUM 24 - Q4c-OR, 07 marks)
18. Give the classification of transducers. (WIN 23 - Q5a, 03 marks)
19. Write a short note on a Light Dependent Resistor (LDR). (WIN 23 - Q5b-OR, 04 marks)
20. List out applications of a capacitive transducer and explain any one in detail. (WIN 23 - Q5a-OR, 03 marks)
21. Explain the measurement of weight and pressure using a strain gauge. (WIN 23 - Q4c-OR, 07 marks)
22. Explain Primary and Secondary transducers. (WIN 24 - Q4a-OR, 03 marks)
23. Explain the use of a capacitive transducer for pressure measurement. (WIN 24 - Q5a-OR, 03 marks)
24. Explain the error produced in a Transducer. (SUM 25 - Q5b, 04 marks)
25. State essential properties of a strain gauge. (SUM 25 - Q4a-OR, 03 marks)
26. Explain the working of a Photovoltaic Cell. (SUM 25 - Q5a, 03 marks)
27. Explain the working principle of a Photo coupler and state its application. (SUM 25 - Q1c, 07 marks)

28. Explain the construction and working of a Photo Transistor. State its advantages and disadvantages. (SUM 25 - Q4c, 07 marks)
29. Write a short note on an opto-coupler. (WIN 22 - Q5a, 03 marks)
30. Explain how the capacitive transducer can be used for the measurement of the level of conducting liquid. (WIN 22 - Q5c, 07 marks)
