GUJARAT TECHNOLOGICAL UNIVERSITY

BE 6 SEMESTER – OLD PAPER – SUMMER 2022 TO SUMMER 2026 – QUESTION BANK

Subject Name & Code: Electrical Measurement and Measuring Instruments - 3160915

Chapter 1: Concepts of Measurement

Repeated Questions:

1. Static and Dynamic Characteristics (Theory):

- **Q.** What do you understand by static and dynamic characteristics of a measuring instrument? **(SUMMER 2022, 3 Marks; WINTER 2024)**
- **Q.** Define the following terms: (1) True value (2) Threshold (3) Sensitivity (4) Zero drift / Define the following terms: (1) True value (2) Threshold (3) Sensitivity **(SUMMER 2022, 4 Marks; WINTER 2023; WINTER 2024; WINTER 2025 - variation of these terms)**

2. Errors in Measurement (Theory):

- **Q.** Differentiate between statistical and random errors. **(SUMMER 2022, 3 Marks; WINTER 2023)**
- **Q.** List types of systematic error. Explain the measures taken to minimize these errors. **(WINTER 2022; WINTER 2025, 3 Marks)**

3. Methods of Measurement (Theory):

- **Q.** Discuss different methods of measurement. **(WINTER 2022; WINTER 2023)**

Other Important Questions:

1. Measurement and Measurement System (Theory):

- **Q.** What is measurement? Describe different methods of measurement. **(SUMMER 2023, 3 Marks)**
- **Q.** Draw a functional block diagram of the measurement system. Also explain the function of each block in brief. **(SUMMER 2024, 7 Marks)**

2. Errors in Measurement (Theory):

- **Q.** Define errors in measurement and explain its types. **(SUMMER 2023, 4 Marks)**
- **Q.** Describe the various types of errors in the measurement system. **(SUMMER 2025, 4 Marks)**
- **Q.** Describe different types of systematic errors. **(SUMMER 2026, 3 Marks)**

3. Static and Dynamic Characteristics – Terms (Theory):

- **Q.** Define 1) Sensitivity 2) Drift 3) Precision. **(SUMMER 2024, 3 Marks)**
- **Q.** Define the terms: (i) Speed of response, (ii) Accuracy, (iii) Precision, (iv) Reproducibility, (v) Drift, (vi) Threshold, (vii) Fidelity. **(WINTER 2022 OR)**
- **Q.** State and Explain Static characteristics of measuring Instruments. **(SUMMER 2025, 7 Marks)**
- **Q.** Explain various dynamic characteristics of a measurement system in brief. **(SUMMER 2026, 4 Marks)**
- **Q.** For a measuring system, explain these static characteristics: 1) Precision and Accuracy; 2) Sensitivity; 3) Linearity. **(SUMMER 2026, 7 Marks)**

Chapter 2: Transducers and Sensors

Repeated Questions:

1. Transducers – Basics and Classification (Theory):

- **Q.** Define transducer and give classification of transducers on different basis. **(WINTER 2023; SUMMER 2024, 7 Marks OR)**
- **Q.** Differentiate between the following citing suitable examples: (i) Active and Passive transducers (ii) Transducers and Inverse transducers. **(WINTER 2022; SUMMER 2025, 4 Marks)**
- **Q.** Define sensor, transducer and actuator. **(SUMMER 2022, 3 Marks; WINTER 2025, 3 Marks)**

2. Displacement Transducers – LVDT and Capacitive:

- **Q.** Explain in detail working principle and construction of LVDT. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks; WINTER 2023; WINTER 2024; WINTER 2025, 7 Marks)**
- **Q.** Explain the different principles of working of capacitive transducers / Explain measurement of displacement using capacitive transducers. **(WINTER 2022; WINTER 2024; SUMMER 2026)**

3. Strain Gauge:

- **Q.** Explain working principle of strain gauge. **(SUMMER 2024, 4 Marks; WINTER 2024)**
- **Q.** Define gauge factor of a strain gauge. Derive the expression for the gauge factor. **(SUMMER 2022, 7 Marks OR; SUMMER 2023, 7 Marks)**
- **Q.** Explain how strain gauges are used for the torque measurement. **(WINTER 2023; WINTER 2024 OR)**

4. Temperature Transducers – Thermocouple and RTD:

- **Q.** Describe construction of thermocouple in detail with different materials used for the same / Explain principle and construction of Thermocouple / Discuss in brief the working principle and materials for thermocouple. **(SUMMER 2022, 7 Marks; WINTER 2023 OR; WINTER 2024 OR; SUMMER 2025, 3 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 3 Marks)**
- **Q.** Describe the working principle, construction and operation of R.T.D. Draw its characteristics. [Diagram required – refer to the original question paper] **(SUMMER 2024, 7 Marks; WINTER 2024)**
- **Q.** Describe the working and construction of resistance thermometers with different materials used for the same. Draw the resistance versus temperature characteristic. [Diagram required – refer to the original question paper] **(WINTER 2022 OR; WINTER 2025, 3 Marks OR)**

5. Piezoelectric and Hall Effect Transducers:

- **Q.** Explain working principle and construction of Piezoelectric transducer. **(SUMMER 2022, 7 Marks; WINTER 2023; WINTER 2024 OR; WINTER 2025, 7 Marks)**
- **Q.** Explain working principle of Hall effect transducer / Explain working principle of Hall effect transducer and state its applications. **(SUMMER 2022, 4 Marks; WINTER 2024; SUMMER 2025; WINTER 2025, 4 Marks)**

Other Important Questions:

1. Transducers – Classification and General (Theory):

- **Q.** Classify Transducer in detail. **(SUMMER 2023, 3 Marks)**
- **Q.** Differentiate between the following transducers with suitable examples: (i) Primary and Secondary transducers (ii) Analog and Digital transducers. **(SUMMER 2023, 4 Marks)**
- **Q.** Explain advantages of electrical transducer. **(SUMMER 2024, 4 Marks)**
- **Q.** Define electrical transducer and discuss general characteristics of transducer. **(WINTER 2022 OR)**

- **Q.** What are the criteria for selection of the transducer? **(SUMMER 2025, 3 Marks OR)**

2. Displacement, Capacitance and Speed Measurement:

- **Q.** Describe with neat sketches the construction and working of L.V.D.T. Also draw its output characteristics. [Diagram required – refer to the original question paper] **(WINTER 2022)**
- **Q.** Explain any one transducer used for measurement of Displacement. **(SUMMER 2025, 7 Marks OR)**
- **Q.** State transducers used for measurement of Capacitance. Explain any one. **(SUMMER 2025, 3 Marks)**
- **Q.** Discuss position sensing using optical encoder. **(SUMMER 2026, 4 Marks OR)**
- **Q.** Explain measurement of speed using hall effect transducer and variable reluctance transducer. **(SUMMER 2026, 7 Marks OR)**

3. Pressure Measurement:

- **Q.** Enlist pressure sensitive primary devices. Explain any one in brief. **(SUMMER 2024, 3 Marks)**
- **Q.** Explain pressure sensing devices. **(SUMMER 2025, 3 Marks)**
- **Q.** Discuss application of strain gauge for pressure measurement. **(SUMMER 2026, 4 Marks)**

4. Thermocouple and Seebeck Effect (Theory):

- **Q.** Explain the construction of Thermocouple and its characteristics for various materials. **(SUMMER 2023, 7 Marks OR)**
- **Q.** Explain Seebeck effect. **(SUMMER 2022, 7 Marks)**

5. Capacitive Transducer (Numerical):

- **Q.** A capacitive transducer with its plate separation of 0.05 mm under static conditions has a capacitance of 5×10^{-12} F. Determine axial displacement, which causes change of capacitance of 0.75×10^{-12} F. **(SUMMER 2022, 4 Marks)**

Chapter 3: Measurement of Parameters

Repeated Questions:

1. Instrument Transformers (Theory):

- **Q.** Describe use of instrument transformers in the extension of range of measuring instruments / How is the instrument range extended by Instrument Transformers? **(SUMMER 2022, 4 Marks; WINTER 2022; WINTER 2023; WINTER 2024 OR; SUMMER 2025 OR; WINTER 2025, 4 Marks)**
- **Q.** Explain why CT secondary should not be open? / Why secondary of current transformer should not be open, when primary is energized? **(SUMMER 2022, 4 Marks OR; SUMMER 2023; WINTER 2023; WINTER 2024; WINTER 2025, 4 Marks OR)**

2. Instrument Transformers (Numerical):

- **Q.** A 250:5 CT is used along with an ammeter. If ammeter reading is 3.6 Amp, find out the line current. **(SUMMER 2022, 3 Marks OR; WINTER 2025, 4 Marks)**

3. Wattmeter, Energy Meter, Frequency Meter and Power Factor Meter:

- **Q.** Explain construction and working principle of electrodynamometer type wattmeter. **(SUMMER 2023, 7 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks)**
- **Q.** Explain construction and working principle of 1-phase induction type energy meter. **(SUMMER 2022, 7 Marks OR; WINTER 2022; SUMMER 2023, 7 Marks; WINTER 2023 OR; SUMMER 2024, 7 Marks OR; WINTER 2024 OR; SUMMER 2026, 7 Marks OR)**
- **Q.** Explain working principle of Weston frequency meter. **(WINTER 2022 OR; SUMMER 2023, 3 Marks OR; WINTER 2023 OR; WINTER 2024 OR)**
- **Q.** Explain the basic working principle of power factor meter / Explain instrument used for the measurement of power factor. **(SUMMER 2025 OR; SUMMER 2026, 3 Marks)**

4. PMMC and Moving Iron Instruments (Theory):

- **Q.** Draw and explain the construction of PMMC instrument. [Diagram required – refer to the original question paper] **(SUMMER 2022, 3 Marks; SUMMER 2023, 4 Marks OR; WINTER 2023; SUMMER 2024, 4 Marks; WINTER 2024; SUMMER 2025, 4 Marks; WINTER 2025, 3 Marks)**
- **Q.** Describe the constructional detail of a moving iron instrument with the help of diagram. Derive the equation for deflection if spring control is used. **(WINTER 2023 OR; SUMMER 2024, 4 Marks OR; WINTER 2024; SUMMER 2025, 3 Marks)**
- **Q.** Explain why electrodynamometer type of instruments can be used both on ac and dc? / Why moving iron instruments can be used with both a.c. and d.c.? **(WINTER 2022 OR; SUMMER 2026 OR)**

Other Important Questions:

1. Range Extension – Shunts, Multipliers and Instrument Transformers:

- **Q.** Explain the role of shunts in extending the range of ammeters. **(SUMMER 2026, 3 Marks)**
- **Q.** How the range of dc voltmeter can be extended? Derive the expression to calculate multiplier resistance. **(SUMMER 2023, 4 Marks)**
- **Q.** List out drawback of Shunt and Multiplier. **(SUMMER 2024, 3 Marks)**
- **Q.** State and explain the methods of extension of range of Voltmeter. **(SUMMER 2024, 7 Marks)**
- **Q.** Explain construction and working of Instrument transformers. **(SUMMER 2024, 3 Marks OR)**
- **Q.** Discuss the role of instrument transformers in extending range of current and voltage measuring instruments. **(SUMMER 2026, 4 Marks)**

2. PMMC and Moving Iron Instruments:

- **Q.** Which methods are used for producing deflecting, controlling and damping torques in a Moving Iron instruments? **(WINTER 2022)**

- **Q.** Describe the construction and working of a PMMC instrument. Derive the equation for deflection for PMMC instrument if the instrument is spring controlled. **(WINTER 2022)**
- **Q.** Why PMMC instrument cannot be used for ac measurement? **(WINTER 2025, 3 Marks)**
- **Q.** What is the basic working principle of moving iron instruments? **(SUMMER 2025, 3 Marks)**
- **Q.** What are the forces or torque required for the operation of the measuring Instruments? **(SUMMER 2025, 3 Marks OR)**
- **Q.** Why the scale is non-uniform in moving iron instruments? **(SUMMER 2026, 1 Marks OR)**

Chapter 4: Measurement of R, L and C

Repeated Questions:

1. Measurement of Low and Medium Resistance:

- **Q.** Draw circuit of Kelvin's double bridge method used for measurement of low resistance. Derive the condition for balance. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks; WINTER 2022; SUMMER 2023, 7 Marks; WINTER 2023; WINTER 2024; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks OR)**
- **Q.** Enlist different methods of measurement for low, medium and high resistances / State different methods. **(WINTER 2023 OR; SUMMER 2024, 3 Marks)**
- **Q.** Discuss use of Wheatstone Bridge for measurement of medium resistance / Explain measurement of resistance with the help of Wheatstone Bridge. **(SUMMER 2024 OR; SUMMER 2026, 4 Marks)**

2. Measurement of High Resistance:

- **Q.** Discuss the loss of charge method for high resistance measurement / Explain measurements of insulation resistance. **(SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks; WINTER 2023; SUMMER 2024; WINTER 2024; SUMMER 2025, 4 Marks; WINTER 2025, 4 Marks OR)**
- **Q.** Discuss the difficulties encountered in measurement of high resistance. **(WINTER 2022 OR; SUMMER 2026, 4 Marks OR)**
- **Q.** Explain any one method for measurement of high resistance. **(WINTER 2023; WINTER 2025, 4 Marks)**

3. AC Bridges and LCR Meter:

- **Q.** Draw circuit of Owen's bridge. Write its applications. [Diagram required – refer to the original question paper] **(SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks OR; WINTER 2024 OR; WINTER 2025, 4 Marks OR)**
- **Q.** Explain the working principle of LCR meter. **(WINTER 2022; WINTER 2023 OR; WINTER 2025 OR; SUMMER 2026, 3 Marks OR)**
- **Q.** Draw relevant circuit and phasor diagrams and explain measurement of self inductance using Hay's Bridge. [Diagram required – refer to the original question paper] **(WINTER 2022 OR; SUMMER 2023, 7 Marks OR; SUMMER 2025, 7 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Draw relevant circuit and phasor diagrams and explain measurement of capacitance using Schering Bridge. [Diagram required – refer to the original question paper] **(WINTER 2022 OR; SUMMER 2023, 3 Marks OR; WINTER 2023 OR; WINTER 2024 OR; SUMMER 2025, 7 Marks; SUMMER 2026, 7 Marks OR)**
- **Q.** Draw and explain circuit diagram of Maxwell's bridge / Explain Maxwell's inductance-capacitance bridge and balance conditions. **(SUMMER 2022; WINTER 2022; SUMMER 2023, 3 Marks; SUMMER 2024 OR; WINTER 2024; SUMMER 2025 OR)**
- **Q.** Draw the circuit diagram of Anderson's bridge. [Diagram required – refer to the original question paper] **(WINTER 2023; WINTER 2024 OR)**

Other Important Questions:

1. Resistance Measurement:

- **Q.** State methods for measurements of low resistances. Explain any one in detail. **(SUMMER 2025, 3 Marks)**
- **Q.** How the effect of contact resistance and resistance of the connecting leads are eliminated using Kelvin's double bridge? Explain with neat diagram. [Diagram required – refer to the original question paper] **(SUMMER 2024, 7 Marks)**

2. Inductance and Capacitance Bridges:

- **Q.** Enlist different bridges used for the measurement of inductance. **(SUMMER 2024, 3 Marks OR)**
- **Q.** Explain Maxwell's bridge with necessary diagram. Write its advantages, disadvantages. Draw phasor diagram. [Diagram required – refer to the original question paper] **(WINTER 2025, 7 Marks)**
- **Q.** Why is Hay's Bridge suitable for measurement of inductors having a Q greater than 10? **(WINTER 2022 OR)**
- **Q.** Draw neat diagram of Schering Bridge, derive the equations of balance. [Diagram required – refer to the original question paper] **(SUMMER 2024, 4 Marks OR)**
- **Q.** Explain measurement of capacitance with the help of De Sauty's Bridge. **(SUMMER 2024, 4 Marks)**

Chapter 5: D.S.O.

Repeated Questions:

1. Digital Storage Oscilloscope:

- **Q.** Draw and explain block diagram of Digital storage oscilloscope. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks OR; SUMMER 2023, 7 Marks - also asks to state its applications; WINTER 2023; SUMMER 2024, 7 Marks - also asks to enlist its applications; WINTER 2024; WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks OR)**
- **Q.** Describe various controls of power scope. **(SUMMER 2022, 3 Marks OR; WINTER 2025, 3 Marks OR)**
- **Q.** Write a short note on Digital recorders. **(WINTER 2022 OR; SUMMER 2023, 3 Marks)**

Other Important Questions:

1. Digital Storage Oscilloscope:

- **Q.** Describe the principle of working of a digital storage oscilloscope. **(WINTER 2022)**

Chapter 6: Display devices

Repeated Questions:

1. Megger, Clamp-on Meter and Q-meter:

- **Q.** Write a brief note on Megger / Explain construction and working principle of Megger / Draw a neat diagram showing essential parts of Megger. **(SUMMER 2022, 3 Marks; SUMMER 2023; WINTER 2023 OR; WINTER 2024; SUMMER 2025; WINTER 2025, 3 Marks; SUMMER 2026)**
- **Q.** What is clamp on meter? Write its applications / Explain the construction and working of Clamp on meter. **(SUMMER 2022, 3 Marks OR; WINTER 2023 OR; SUMMER 2024, 3 Marks; WINTER 2024 OR; SUMMER 2025; SUMMER 2026 OR)**
- **Q.** Explain construction and working of Q-meter. **(SUMMER 2022, 7 Marks; SUMMER 2023, 4 Marks; WINTER 2025, 7 Marks)**

2. Digital Multimeters, Digital Voltmeters and Display Devices:

- **Q.** Compare Analog and digital multimeter. **(SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks; SUMMER 2024, 3 Marks OR; WINTER 2025, 4 Marks)**
- **Q.** Give an overview of different digital display devices. **(WINTER 2022 OR; SUMMER 2025, 4 Marks OR)**
- **Q.** List the different types of digital voltmeters. Explain any one in detail. **(WINTER 2022 OR; SUMMER 2026, 7 Marks OR)**

Other Important Questions:

1. Digital Multimeter and Megger:

- **Q.** Draw the block diagram of digital multimeter and explain in brief. [Diagram required – refer to the original question paper] **(SUMMER 2026, 4 Marks OR)**
- **Q.** Describe the construction, working and application of megger with suitable diagram. [Diagram required – refer to the original question paper] **(SUMMER 2024, 7 Marks OR)**

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