GUJARAT TECHNOLOGICAL UNIVERSITY

BE-6 SEMESTER – OLD PAPER – S22 TO W25 – QUESTION BANK

Subject Name & Code:

ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS (3160915)

Unit 1: Concepts of Measurement

Repeated Questions:

1. **What do you understand by static and dynamic characteristics of a measuring instrument?**
   (W25 - Q1a, 03 marks) (W24 - Q1a, 03 marks) (S22 - Q1a, 03 marks)
2. **List types of systematic error. Explain the measures taken to minimize these errors.**
   (W25 - Q1a, 03 marks) (W22 - Q1b, 04 marks)
3. **Define the following terms: (1) True value (2) Threshold (3) Sensitivity (4) Zero drift (5) Reproducibility (6) Accuracy (7) Fidelity.**
   (W25 - Q3c, 07 marks) (W23 - Q1a, 03 marks) (S22 - Q1b, 04 marks)

Other Important Questions:

(Listed newest to oldest)

4. **State and Explain Static characteristics of measuring Instruments.**
   (S25 - Q1c, 07 marks)
5. **Describe the various types of errors in the measurement system.**
   (S25 - Q3b, 04 marks)
6. **What is measurement? Describe different methods of measurement.**
   (S23 - Q1a, 03 marks)
7. **Define errors in measurement and explain its types.**
   (S23 - Q1b, 04 marks)
8. **Define 1) Sensitivity 2) Drift 3) Precision.**
   (S24 - Q1a, 03 marks)
9. **Explain advantages of electrical transducer.**
   (S24 - Q1b, 04 marks)
10. **Draw a functional block diagram of the measurement system. Also explain the function of each block in brief.**
    (S24 - Q1c, 07 marks)
11. **Discuss different methods of measurement.**
    (W22 - Q2a, 03 marks)
12. **Differentiate between statistical and random errors.**
    (W23 - Q2b, 04 marks) (S22 - Q2a, 03 marks)
13. **Define transducer and classify it.**
    (W23 - Q2c, 07 marks)
14. **Define: (i) Speed of response, (ii) Accuracy, (iii) Precision, (iv) Reproducibility, (v) Drift, (vi) Threshold, (vii) Fidelity.**
    (W22 - Q2d, 07 marks)
15. **Explain different methods of measurement.**
    (W23 - Q1b, 04 marks)

Unit 2: Transducers and Sensors

Repeated Questions:

1. **Explain in detail working principle and construction of LVDT. Explain how magnitude and direction of displacement can be detected.**
   (W25 - Q1c, 07 marks)
   (W22 - Q1c, 07 marks)
   (W23 - Q1c, 07 marks)
   (S22 - Q1c, 07 marks)
   (W24 - Q1b, 07 marks)
   (S23 - Q1c, 07 marks)
2. **Explain construction of thermocouple in detail with different materials used.**
   (W25 - Q2c, 07 marks)
   (W22 - Q2c OR, 07 marks)
   (W23 - Q2c OR, 07 marks)
   (S22 - Q2c, 07 marks)
   (S23 - Q2c OR, 07 marks)
   (S25 - Q1a, 03 marks)
3. **Explain working principle and construction of Piezoelectric transducer.**
   (W25 - Q3c, 07 marks)
   (W23 - Q3c, 07 marks)
   (W24 - Q4c OR, 07 marks)
   (S22 - Q3c, 07 marks)
4. **Define sensor, transducer & actuator.**
   (W25 - Q3a, 03 marks)
   (S22 - Q3a, 03 marks)
5. **Differentiate between Active and Passive transducers with examples.**
   (W22 - Q2b(i), 04 marks)
   (S25 - Q1b(i), 04 marks)
6. **Describe working and construction of resistance thermometers (RTD). Draw resistance vs temperature characteristic.**
   (W25 - Q3a OR, 07 marks)
   (W22 - Q3c, 07 marks)
   (W24 - Q2c, 07 marks)
   (S24 - Q2c, 07 marks)

Other Important Questions:

(Newest to oldest)

7. **Explain (i) Active and Passive transducers (ii) Transducers and Inverse transducers with suitable examples.**
   (S25 - Q1b, 04 marks)
8. **Explain principle and construction of Thermocouple.**
   (S25 - Q1a, 03 marks)
9. **Explain pressure sensing devices.**
   (S25 - Q3a, 03 marks)
10. **Describe the working principle of Hall effect transducers. Also state its applications.**
    (S25 - Q3c, 07 marks)
11. **What are the criteria for selection of the transducer?**
    (S25 - Q3a OR, 03 marks)
12. **Explain any one transducer used for measurement of Displacement.**
    (S25 - Q4c OR, 07 marks)
13. **State transducers used for measurement of Capacitance. Explain any one.**
    (S25 - Q5a, 03 marks)
14. **Classify Transducer in detail.**
    (S23 - Q2a, 03 marks)

15. **Differentiate between: (i) Primary and Secondary transducers (ii) Analog and Digital transducers.**
    (S23 - Q2b, 04 marks)
16. **Define gauge factor of a strain gauge. Derive the expression for the gauge factor.**
    (S23 - Q2c, 07 marks)
17. **Explain the construction of Thermocouple and its characteristics for various materials.**
    (S23 - Q2c OR, 07 marks)
18. **Enlist pressure sensitive primary devices. Explain any one in brief.**
    (S24 - Q2a, 03 marks)
19. **Explain working principle of strain gauge.**
    (S24 - Q2b, 04 marks)
    (W24 - Q2a, 03 marks)
20. **Describe the working principle, construction and operation of R.T.D. Draw its characteristics.**
    (S24 - Q2c, 07 marks)
    (W24 - Q2c, 07 marks)
21. **Define transducer & give classification of transducers on different basis.**
    (S24 - Q2c OR, 07 marks)
22. **Explain different principles of working of capacitive transducers for measurement of displacement.**
    (W22 - Q3a, 03 marks)
    (W24 - Q3b OR, 03 marks)
    (S22 - Q4a OR, 03 marks)
23. **Explain how strain gauges are used for torque measurement.**
    (W23 - Q2a, 03 marks)
    (W24 - Q3a OR, 03 marks)
24. **Explain working principle of Hall effect transducer.**
    (W25 - Q4b, 04 marks)
    (S22 - Q4b, 04 marks)
    (W24 - Q5b, 04 marks)
    (S23 - Q5b, 04 marks)
25. **Explain any one transducer used for measurement of speed.**
    (W22 - Q5a, 03 marks)
26. **Define electrical transducer and discuss general characteristics of transducer.**
    (W22 - Q5c, 07 marks)

Unit 3: Measurement of Parameters

Repeated Questions:

1. **Describe use of instrument transformers in extension of range of measuring instruments.**
   (W25 - Q1b, 03 marks)
   (S22 - Q3b, 03 marks)
   (W22 - Q3b, 04 marks)
   (W23 - Q3a, 03 marks)
   (S25 - Q3b OR, 04 marks)
   (W24 - Q4a OR, 03 marks)
2. **Explain why PMMC instrument cannot be used for AC measurement?**
   (W25 - Q2a, 03 marks)
3. **Explain construction and working principle of electrodynamometer type wattmeter.**
   (W25 - Q2c OR, 07 marks)
   (W22 - Q2c OR, 07 marks)
   (S23 - Q3c OR, 07 marks)
   (S25 - Q3c OR, 07 marks)
4. **Explain why CT secondary should not be kept open?**
   (W25 - Q3b OR, 04 marks)
   (S22 - Q3b OR, 04 marks)
   (W24 - Q4a, 03 marks)
   (S23 - Q3a, 03 marks)
5. **Explain construction and working principle of 1-phase induction type energy meter.**
   (W22 - Q3c, 07 marks)
   (W23 - Q3c OR, 07 marks)
   (S22 - Q3c OR, 07 marks)
   (S23 - Q3c, 07 marks)
   (W24 - Q3a OR, 07 marks)
   (S24 - Q3c, 07 marks)
6. **Draw & explain construction of PMMC instrument.**
   (W25 - Q4a, 03 marks)
   (S22 - Q4a, 03 marks)
   (W22 - Q4b OR, 04 marks)
   (S23 - Q3b OR, 04 marks)
   (S24 - Q3b, 04 marks)
   (S25 - Q4b, 04 marks)
7. **Compare Analog & digital multimeter.**
   (W25 - Q5b, 04 marks)
   (S22 - Q5b, 04 marks)
   (S23 - Q5b, 04 marks)
   (S24 - Q5a OR, 03 marks)

Other Important Questions:

(Newest to oldest)

8. **Explain instrument used for measurement of power factor.**
   (S25 - Q4b OR, 04 marks)
9. **What is the basic working principle of moving iron instruments?**
   (S25 - Q4a, 03 marks)
10. **What are the forces or torque required for operation of measuring instruments?**
    (S25 - Q4a OR, 03 marks)
11. **Which methods are used for producing deflecting, controlling and damping torques in Moving Iron instruments?**
    (W22 - Q1a, 03 marks)
12. **Explain why electrodynamometer type instruments can be used both on AC and DC?**

(W22 - Q3a OR, 03 marks)

13. **Explain working principle of Weston frequency meter.**
    (W22 - Q3b OR, 04 marks)
    (W23 - Q3a OR, 03 marks)
    (W24 - Q3b OR, 03 marks)
    (S23 - Q3a OR, 03 marks)
14. **A 250:5 CT is used with an ammeter. If ammeter reading is 3.6 A, find line current.**
    (W25 - Q3b, 03 marks)
    (S22 - Q3a OR, 03 marks)
15. **How is instrument range extended by Instrument Transformers?**
    (W23 - Q3a, 03 marks)
    (W24 - Q4a OR, 03 marks)
16. **Describe constructional detail of moving iron instrument with diagram. Derive deflection equation if spring control is used.**
    (W23 - Q4c OR, 07 marks)
    (W24 - Q1c, 07 marks)
    (S24 - Q3b OR, 04 marks)
17. **State and explain methods of extension of range of Voltmeter.**
    (S24 - Q3c, 07 marks)
18. **List drawback of Shunt and Multiplier.**
    (S24 - Q3a, 03 marks)
19. **Explain construction and working of Instrument transformers.**
    (S24 - Q3a OR, 03 marks)
20. **How is range of DC voltmeter extended? Derive expression for multiplier resistance.**
    (S23 - Q3b, 04 marks)

Unit 4: Measurement of R, L and C

Repeated Questions:

1. **Explain any one method for measurement of high resistance.**
   (W25 - Q2b, 04 marks)
   (W23 - Q4b, 04 marks)
2. **Explain Maxwell's bridge with diagram, advantages, disadvantages. Draw phasor diagram.**
   (W25 - Q4c, 07 marks)
   (S22 - Q3c, 07 marks)
   (W24 - Q5c, 07 marks)
   (S23 - Q4a, 03 marks)
3. **Draw circuit of Kelvin's double bridge for low resistance measurement. Derive balance condition.**
   (W25 - Q4c OR, 07 marks)
   (W22 - Q2c, 07 marks)
   (W23 - Q4c, 07 marks)
   (S22 - Q4c, 07 marks)
   (W24 - Q3d, 07 marks)
   (S23 - Q4c, 07 marks)
   (S25 - Q2c OR, 07 marks)
4. **Explain loss of charge method for high resistance measurement.**
   (S22 - Q5b OR, 04 marks)
   (W23 - Q5b, 04 marks)
   (W24 - Q4b, 03 marks)
   (S23 - Q3b OR, 04 marks)
   (S24 - Q4b, 04 marks)
   (S25 - Q2b, 04 marks)
5. **Explain measurement of unknown capacitance using Schering bridge. Draw phasor diagram.**
   (W22 - Q4c, 07 marks)
   (W24 - Q5c OR, 07 marks)
   (S23 - Q4a OR, 03 marks)
   (S25 - Q2c, 07 marks)
   (S24 - Q4b, 04 marks)
6. **Explain working principle of LCR meter.**
   (W22 - Q5a, 03 marks)
   (S22 - Q5a OR, 03 marks)
   (S23 - Q4b, 04 marks)

Other Important Questions:

(Newest to oldest)

7. **State methods for measurements of low resistances. Explain any one in detail.**
   (S25 - Q2a, 03 marks)
8. **Explain measurement of unknown inductance with Hay's bridge. Draw phasor diagram.**
   (S25 - Q4c, 07 marks)
   (S23 - Q4c OR, 07 marks)
9. **Draw circuit diagram of Maxwell's Inductance bridge.**
   (S25 - Q5a OR, 03 marks)
10. **Draw circuit diagram of Anderson's bridge.**
    (W23 - Q3b, 04 marks)
    (W24 - Q4b OR, 04 marks)
11. **State different methods used to measure low, medium and high resistance.**
    (W23 - Q3b OR, 04 marks)
    (S24 - Q4a, 03 marks)

12. **Define Gauge factor. Derive its expression.**
    (S22 - Q2c OR, 07 marks)
13. **Explain measurement of inductance & capacitance with AC Bridges (Hays, Schering, Maxwell, Anderson).**
    (From syllabus image - explicit topic)
14. **Enlist different bridges used for measurement of inductance.**
    (S24 - Q4a, 03 marks)
15. **Draw neat diagram of Schering Bridge, derive balance equations.**
    (S24 - Q4b, 04 marks)
16. **Explain Maxwell's inductance-capacitance bridge. Derive balance equation and draw phasor diagram.**
    (S24 - Q4c, 07 marks)
17. **Explain measurement of capacitance with De Sauty's Bridge.**
    (S24 - Q5b, 04 marks)
18. **Explain measurement of resistance with Wheatstone Bridge.**
    (S24 - Q5b OR, 04 marks)
19. **A capacitive transducer with plate separation 0.05 mm under static conditions has capacitance 5×10^{-12} F. Determine axial displacement causing change of capacitance 0.75×10^{-12} F.**
    (S22 - Q2b, 04 marks) [Numerical question]

Unit 5: D.S.O. & Display Devices

Repeated Questions:

1. **Explain construction and working of Q-meter.**
   (W25 - Q5c, 07 marks)
   (S22 - Q5c, 07 marks)
   (S23 - Q4b OR, 04 marks)
2. **Draw & explain block diagram of Digital Storage Oscilloscope (D.S.O.). State applications.**
   (W25 - Q4c OR, 07 marks)
   (W22 - Q5c, 07 marks)
   (W23 - Q5c, 07 marks)
   (S22 - Q4c OR, 07 marks)
   (W24 - Q4c, 07 marks)
   (S23 - Q5c, 07 marks)
   (S25 - Q5c, 07 marks)
3. **Write a brief note on Megger.**
   (W25 - Q5a, 03 marks)
   (S22 - Q5a, 03 marks)
   (W24 - Q5a, 03 marks)
   (S23 - Q5c OR, 07 marks)
   (S24 - Q5c OR, 07 marks)
   (S25 - Q5c OR, 07 marks)
4. **Explain Clamp on meter. Write its applications.**
   (S22 - Q3a, 03 marks)
   (W24 - Q5a OR, 03 marks)
   (S23 - Q3a, 03 marks)
   (S24 - Q5a, 03 marks)
   (S25 - Q5b, 04 marks)

Other Important Questions:

5. **Explain different types of digital display.**
   (S25 - Q5b OR, 04 marks)
6. **Describe various controls of power scope.**
   (W25 - Q4a OR, 03 marks)
   (S22 - Q4a OR, 03 marks)
7. **Draw circuit of Owen's bridge. Write its applications.**
   (W25 - Q4b OR, 04 marks)
   (S22 - Q4b OR, 04 marks)
   (W24 - Q5b OR, 04 marks)
   (S23 - Q4b OR, 04 marks)
8. **Give an overview of different digital display devices.**
   (W22 - Q5b, 04 marks)
9. **Write a short note on digital recorders.**
   (W22 - Q5a OR, 03 marks)
   (S23 - Q5a, 03 marks)
10. **What are difficulties in measurement of high resistance? Explain how overcome.**
    (W22 - Q5b OR, 04 marks)
11. **List different types of digital voltmeters. Explain any one in detail.**
    (W22 - Q5c OR, 07 marks)
12. **Explain block diagram of D.S.O. Enlist its applications.**
    (S24 - Q5c, 07 marks)
13. **Describe construction, working and application of megger with diagram.**
    (S24 - Q5c OR, 07 marks)

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