

QUESTION BANK

ELECTRICAL MEASUREMENTS

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UNIT-1

1. Define and explain the static characteristics of an instrument.
2. Draw and explain the general block diagram of measurement systems and explain the function of each block?
3. Write a note on different types of errors.
4. What are the basic functional blocks of a generalized instrumentation system? Draw the various blocks and explain their functions.
5. A circuit was tuned for resonance by eight different students, and the value of resonant Frequency in kHz were recorded as 532, 548, 543, 535, 546, 531, 543 and 536. Calculate (i) the Arithmetic mean, (ii) deviation from mean, (iii) average deviation and (iv) standard deviation
6. The probable values of two resistors and their S.D are specified as $R_1=18.62 \Omega$, $SD=0.025\Omega$, $R_2=74.48\Omega$, $SD=0.05\Omega$. Find the probable value and SD for the two resistors when they are Connected in 1. Series 2. Parallel
7. Discuss the different types of standards of measurements.
8. Describe the static and dynamic characteristics of measuring instrument.
9. Explain the concept of static evaluation of measurement data.
10. Describe the different calibration procedures of measuring instrument.
11. Explain any four static characteristics of measuring instrument.
12. How are errors classified? Explain systematic error.
13. Explain the classification of standards in detail.
14. How are histogram and arithmetic mean helpful in the statistical analysis of data?
15. Explain in detail, different static characteristics of a measurement system with examples.

16. Discuss in detail, about calibration.
17. Describe the various modes of statistical evaluation of measurement data.
18. Explain the functional elements of an instrument with a neat block diagram and draw the static and dynamic characteristics.
19. Define accuracy and reproducibility of an instrument and explain.
20. What are the different types of errors? Explain how to eliminate errors in instrument.
21. Describe primary and secondary standards in instruments.
22. By using a micrometer screw, the following readings were taken of a certain length: 1.34, 1.38, 1.56, 1.47, 1.42, 1.44, 1.53, 1.48, 1.40, 1.59 mm. Calculate i) the Arithmetic mean, (ii) average deviation and (iii) standard deviation (iv) Variance.

UNIT-2

1. Describe the construction and working principle of single phase induction type energy meter. Write a short note on any two adjustments required in energy meters.
2. Explain with neat sketch the classification of instrument transformers. Write a note on the errors affecting the characteristics of an instrument transformer.
3. With neat sketch, explain the construction and working principle of single phase Wattmeter.
4. What are the importance of deflection torque in these instruments?
5. Write the short notes on use of current transformer for current and power measurement
6. Write the short notes on working of Weston frequency meter.
7. What are the various types of digital Voltmeters? With neat sketch, explain the working principle of any one type of a digital Voltmeters.
8. With neat sketch, explain the construction and working principle of electro-dynamometer type Wattmeter. Also derive its torque equation.
9. Explain the method of measurement of B.H curve of a ring specimen with neat diagram.
10. Describe the construction and working principle of digital frequency meter.
11. Describe the functional operation of Energy meter.
12. Describe the basic magnetic measurement using B.H curve.

13. Explain the operating principle of instrument transformer.
14. How to measure power using instrument transformers? Explain.
15. How is multimeter used to measure different parameters? Explain.
16. How do you determine the B.H Curve using 'step by step' method?
17. What are the different methods used for the measurement of frequency? Explain any one method.
18. A PMMC ammeter gives reading of 40 mA when connected across two opposite corners of a bridge rectifier, the other two corners of which are connected in series with a capacitor to 100 K, 50 Hz supply. Determine the capacitance?
19. Describe the construction and working principle of permanent magnet moving coil instrument. Also derive the expression for deflection?
20. Explain the methods of turns compensation used in current transformer to reduce ratio errors?
21. Explain the term 'loading' in voltmeter and give the method to remove the adverse effect of the same?

UNIT-3

1. With neat sketch describe a bridge to determine the unknown inductance and a bridge to determine the unknown capacitance?
2. Explain the grounding techniques in detail to reduce the ground loop interference signal?
3. What are the difficulties associated with measurement of low resistance? Describe how low resistance is measured accurately by Kelvin's Double bridge?
4. Discuss the effect of electro static and electromagnetic interference in instruments?
5. Write short notes on grounding techniques?
6. Draw a neat sketch of a modern slide-wire DC potentiometer and discuss how the potentiometer is standardized?
7. Describe how co-ordinate type potentiometer can be used for calibration of a voltmeter and AC energy meters?
8. Explain the theory and working principle of Kelvin's Double bridge method for measurement of low resistance. Derive the relation for finding unknown resistance?

9. Discuss briefly how Hay's Bridge can be used for measurement of inductance?
10. Describe the operation of AC potentiometer?
11. With neat sketch bridge network, derive the general equation for bridge balance with a neat AC bridge diagram?
12. Explain the operation of Schering Bridge to determine the unknown capacitance. Derive the relevant equations and explain the computation procedure using phasor diagram?
13. How does one measure the resistance using potentiometer?
14. How do you measure the phasor angle using ratio transformer?
15. Explain in detail the electro-static and electro-magnetic interference?
16. Mention the importance of grounding. What are the different grounding techniques used?
17. In a balanced network, AB is the resistance of 500Ω in series with an inductor of $0.18H$, BC and DA are non-inductive resistance of $1k\Omega$ each and CD consists of a resistance R in series with a capacitor C . A potential difference of $5V$ at a frequency of $5000/2\pi$ is applied between points A and C. Determine the values of R and C ?
18. Draw and explain the balance conditions of a Wheatstone bridge?
19. Explain the construction of Anderson's Bridge. Derive the unknown quantities at balance condition. Also write its advantages and disadvantages?
20. Determine the insulation resistance of a short length of cable in which voltage falls from 123 to $100V$ in 25 seconds. The capacity of the condenser is $600 \times 10^{-13}F$.
21. Explain how the inductance is measured in terms of known capacitance using Maxwell's bridge. Derive the condition for balance?
22. Explain the grounding techniques?
23. Explain the causes of electromagnetic measurements in measurements?
24. With a circuit diagram, explain the principle of operation of Dou-range DC potentiometer?
25. Draw a neat diagram, of Kelvin's Double Bridge and explain how to measure low resistance?
26. Obtain an expression for measurement of inductance using Maxwell's Inductance Bridge with a neat circuit diagram.

27. Explain the procedure of measuring a low resistance with help of Kelvin's Double Bridge. Derive the relation to finding unknown resistance?
28. Describe in detail about interference and screening?
29. Describe in detail about multiple earth and earth loops?

UNIT 4

1. Explain in segmental display and dot matrices display for numeric and alpha numeric displays?
2. Write short notes on data logging?
3. Draw and explain the block diagram of digital CRO?
4. Describe different types of sweeps used in CRO?
5. Describe the construction and working of magnetic tape recorder?
6. With a block diagram explain the working of digital CRO?
7. Draw neat block diagram of X-Y recorder and describe its working?
8. Explain the principle and working of CRT display with a neat diagram?
9. With the help of the fundamental block diagram, explain the working principle of digital storage oscilloscope, mention its advantage over analog CRO?
10. With neat diagram, explain the basic components and working principle of magnetic tape recorders?
11. Explain the working of magnetic tape recorders?
12. Compare and contrast the working, advantages and disadvantages of LED and LCD?
13. Discuss the working of digital CRO?
14. Write a detail technical note on dot matrix display?
15. Draw the block diagram of X-Y recorder and explain?
16. Explain data loggers in detail?
17. Draw the internal block diagram of CRT and explain?
18. Compare the features of FM recording with PDM recording?
19. Write short notes on Magnetic disk and tape?
20. Write brief note on recorders and printers?

21. With the help of simplified block diagram, explain the construction and operating principle of general purpose Cathode Ray Oscilloscope?
22. Explain the construction and its working principle of X-Y recorders?
23. Briefly discuss the features of digital plotters and printers?
24. Explain the working principle of digital storage oscilloscope?
25. Explain the working principle of electrostatic deflection system in a CRT?
26. Explain the working of magnetic tape recorders. What are its basic components and their functions?
27. Briefly discuss the use of LED and LCD as display devices in instrumentation. Comment on their relative merits and demerits?
28. Describe the LED and LCD devices?
29. Describe the direct and frequency modulation magnetic tape recording types. Give its merits and demerits?

UNIT-5

1. What are the selection criteria for the transducer? Explain the working principle of LVDT with neat sketch and characteristics. Give advantages, disadvantages and application of LVDT?
2. What are the performance parameters and of analog to digital converters? Explain any two basic A/D conversion techniques in detail?
3. Explain the principle of the Strain gauge transducer?
4. Explain the principle of the Piezoelectric transducer?
5. Explain the construction and working of optical encoders with a neat diagram?
6. Draw the generalized block diagram of a digital data acquisition system and explain?
7. Explain the construction and working of unbounded and bounded type strain gauges?
8. Explain the successive approximation method of A/D converter?
9. Explain the measurement of resistance using strain gauge?
10. Describe the various factors influencing the type of transducer for a particular application?

11. Explain the principle of the A/D transducer?
12. Explain the principle of the Piezoelectric transducer?
13. Tabulate the principle of operation and typical application of resistive, capacitive and inductive transducers?
14. Why do we need to acquire data? What are the blocks involved in Digital DAQ systems?
15. What is self-generating transducer? Give two examples of self-generating transducers and explain its working principle?
16. Explain smart sensors in detail?
17. Explain the successive approximation type ADC with its characteristics?
18. A 5-plate transducer has plates of dimension 20mm x 20mm and separated 0.25mm apart. The arrangement is to be used for measuring displacement. Determine the sensitivity of the arrangement. Assume air medium.
19. Describe the principle of operation of LVDT and its characteristics?
20. A linear resistance potentiometer is 50mm long and it's uniformly wound with wire of total resistance of 5k Ω . Under normal conditions the slider is at the center of the potentiometer. Determine the linear displacement when the resistance of the potentiometer, as measured by the Wheatstone bridge, is 1850 Ω . If it is possible to measure a minimum value of 5 Ω resistance with the above arrangement, determine the resolution of the potentiometer in mm?
21. Describe the principle of operation of linear variable differential transformer LVDT and its characteristics?
22. What is data acquisition system? With generalized block diagram explain the function of it?
23. Write short notes on smart sensors?
24. Describe the construction and working of potentiometer type resistance transducer for measuring linear displacement??
25. Explain the working D/A converters with a neat diagram?
26. What is piezoelectric transducer? Explain its working with a diagram?
27. Explain how to measure pressure using capacitive transducer?
28. Write short notes on Seebeck effect?
29. Write short notes on Piezo electric transducer?

30. Write short notes on Resistance thermometers?

31. Explain the basis operation of A/D converter utilizing D/A converters?

32. Explain the concept of Smart Sensors?