PANDIAN SARASWATHI YADAV ENGINEERING COLLEGE

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EE6404-MEASUREMENTS AND INSTRUMENTATION

ACADEMIC YEAR: 2015-2016 (EVEN SEMESTER)

Branch: EEE **Semester: IV**

QUESTION BANK

UNIT – I
INTRODUCTION
PART – A

1. What are the functional elements of an instrument? (2)
2. What is meant by accuracy of an instrument? (2)
3. Define international standard for ohm? (2)
4. What is primary sensing element? (2)
5. What is calibration? (2)
6. Define the terms precision & sensitivity. (2)
7. What are primary standards? Where are they used? (2)
8. When are static characteristics important? (2)
9. What is standard? What are the different types of standards? (2)
10. Define static error. Distinguish reproducibility and repeatability. (2)
11. Distinguish between direct and indirect methods of measurements. (2)
12. With one example explain “Instrumental Errors”. (2)
13. Name some static and dynamic characteristics. (2)
14. State the difference between accuracy and precision of a measurement. (2)
15. What are primary and secondary measurements? (2)
16. What are the functions of instruments and measurement systems? (2)
17. What is an error? How it is classified? (2)
18. Classify the standards of measurement? (2)
19. Define standard deviation and average deviation. (2)
20. What are the sources of error? (2)

PART – B

1. Describe the functional elements of an instrument with its block diagram. And illustrate Them with pressure gauge, pressure thermometer and D’Arsonval galvanometer. (16)

2. What are the three categories of systematic errors in the instrument and explain in detail. (16)

3. (i) What are the basic blocks of a generalized instrumentation system. Draw the Various blocks and explain their functions. (10)
   (ii) Explain in detail calibration technique and draw the calibration curve in general. (6)

4. (i) Discuss in detail various types of errors associated in measurement and how these errors can be minimized? (10)
   (ii) Define the following terms in the context of normal frequency distribution of data (6)
   a) Mean value, b) Deviation, c) Average deviation, d) Variance e) Standard deviation.

b)

5. (i) Define and explain the following static characteristics of an instrument. (8)
   a) Accuracy, b) Resolution, c) Sensitivity and d) Linearity
   (ii) Define and explain the types of static errors possible in an instrument. (8)

6. Discuss in detail the various static and dynamic characteristics of a measuring system. (16)

7. (i) For the given data, calculate
   a) Arithmetic mean, b) Deviation of each value, c) Algebraic sum of the deviations (6)
   b) X1 = 49.7, X2 = 50.1, X3 = 50.2, X4 = 49.6, X5 = 49.7
   (ii) Explain in detail the types of static error. (7)
   (iii) Give a note on dynamic characteristics. (3)

8. (i) What is standard? Explain the different types of standards? (8)
   (ii) What are the different standard inputs for studying the dynamic response of a system? Define and sketch them. (8)

9. a) Define resolution. (4) b) What is threshold? (4)
   c) Define zero drift. (4) d) What are random errors? (4)

UNIT – II

ELECTRICAL AND ELECTRONICS INSTRUMENTS

PART – A

1. State the principle of digital voltmeter. (2)
2. Give the importance of iron loss measurement. (2)
3. List two instruments for measurement of frequency. (2)
4. Write the function of instrument transformer. (2)
5. Brief the principle of digital phase meter. (2)
6. Write any two advantages and disadvantages of digital voltmeter. (2)
7. Explain the purpose of Schmitt trigger in digital frequency meter. (2)
8. Which torque is absent in energy meter? Why? (2)
9. What are the errors that take place in moving iron instrument? (2)
10. Explain the principle of analog type electrical instruments. (2)
11. How a PMMC meter can be used as voltmeter and ammeter? (2)
12. What is loading effect? (2)
13. State the basic principle of moving iron instrument. (2)
14. Why an ammeter should have a low resistance? (2)
15. Define the sensitivity of a moving coil meter. (2)
16. What are the precautions taken while using a DC voltmeter and DC Ammeter? (2)
17. What is the use of Multimeter? Write its advantages and disadvantages. (2)
18. Voltmeter has high resistance, why it is connected in series? (2)
19. What is an energy meter? Mention some advantages and disadvantages of energy meter. (2)
20. What is meant by creep adjustment in three phase energy meter? (2)

PART – B

1. (i) Describe the construction and working of a permanent magnetic moving coil instruments. (10)
   (ii) Explain the design of three phase wattmeters and give the reactive power measurement in 3 phase circuits. (6)

2. (i) How B-H curve is determined for a ring specimen. (8)
   (ii) Explain the frequency measurement in Wien's bridge (8)

3. Discuss why it is necessary to carry out frequency domain analysis of measurement Systems? What are the two plots obtained when the frequency response of a system is carried out? (16)

4. Explain the function of three phase wattmeter and energy meter. (16)

5. (i) Sketch the circuit and waveforms for ac voltmeter using a PMMC Instrument and half wave rectifier. Explain the circuit operation. (10)
   (ii) Develop the torque equation for a PMMC instrument and show its scale is linear (6)

6. (i) Discuss in detail the working of the successive approximation DVM.(8)
   (ii) With a neat diagram, explain the various methods of magnetic measurements.(8)

7. (i) Explain with a neat sketch the construction and working principle of single-phase induction type energy meter. (10)
   (ii) How the range of d.c ammeter and d.c voltmeter can be extended? Derive the expressions to calculate shunt resistance and multiplier resistance. (6)

8. (i) With a neat diagram explain the construction and working of electrodynamometer type instruments. Also derive its torque equation. (10)
   (ii) Explain with neat diagram the working of Linear ramp type DVM. (6)

9. (i) Explain the different methods of determination of B –H curve (8)
   (ii) With block diagram explain the working principle of digital frequency meter. (8)

10. (i) Explain the working principle of moving iron instrument. (8)
    (ii) Give a detailed note on Instrument transformers. (8)

UNIT-III

COMPARISON METHODS OF MEASUREMENTS

PART – A

1. Draw Maxwell's AC bridge and give the balance equation interms of resistance. (2)
2. Explain any two technical parameters to be consider in grounding. (2)
3. Give some applications of Wheatstone's bridge. (2)
4. What is a potentiometer? (2)
5. List the applications of dc and ac potentiometer. (2)
6. Differentiate the principle of dc potentiometer and ac potentiometer. (2)
7. What is meant by transformer Ratio Bridge? (2)
8. What are the features of ratio transformer? List its applications. (2)
9. What is meant by electromagnetic interference? (2)
10. List the sources of electromagnetic interference. (2)
11. What are the ways of minimizing the electromagnetic interference? (2)
12. Define electromagnetic compatibility. (EMC) (2)
13. What are the main causes of group loop currents? (2)
14. What are the limitations of single point grounding method? (2)
15. What is the necessity of grounding and state is advantages. (2)
16. What is meant by ground loop? How it is created? (2)
17. What are the sources of errors in bridge measurement? (2)
18. Define standardization. (2)
19. Give the relationship between the bridge balance equation of DC bridge and AC bridge (2)
20. What does a bridge circuit consists of? (2)

PART – B

1. Explain in detail about the laboratory type DC potentiometer. (16)
2. Describe about the multiple earth and earth loops. (16)
3. Explain voltage sensitive self balancing bridge, and derive the bridge sensitivity of voltage sensitive bridge with fundamentals. (16)
4. With fundamentals distinguish between DC and AC potentiometers, and give any two specific applications for each. (16)
5. Discuss the advantages and limitations of electromagnetic interference in measurements. (16)
6. Explain Kelvin's double bridge method for the measurement of low resistance. (16)
7. Explain how inductance in measured by using Maxwell's bridge. (16)
8. Explain the working principle of Anderson's bridge and also derive its balance equations. (16)
9. Explain the working principle of Schering bridge and also derive its balance equations.(16)
10. (i) Give the applications of AC potentiometers. (8)
    (ii) Explain the different techniques of grounding. (8)

UNIT- IV

STORAGE AND DISPLAY DEVICES

PART – A

1. What is meant by deflection sensitivity of a CRT? (2)
2. Write two advantages of LED in electronic displays. (2)
3. State the features of ink-jet printers. (2)
4. Differentiate between LED and LCD. (2)
5. What are the different types of magnetic recording? (2)
6. What are the different materials used in LED? Also name the colours emitted. (2)
7. Give a short note on LED. (2)
8. What is delayed sweep? (2)
9. Explain the characteristics of Time domain output device using in measurements. (2)
10. Explain the following term as applied to digital displays.
(2) 3 ½ digit and 4 ½ digit displays.
11. What is a recorder and what are the types of it? (2)
12. What is magnetic tape recorder? (2)
13. What are the basic components of a tape recorder? (2)
14. List the advantages and disadvantages of direct recording? (2)
15. What are display devices? (2)
16. What are the advantages and disadvantages of digital data recording? (2)
17. Compare line printer and dot matrix printer. (2)
18. What is CRO? What are the sections of a CRO? (2)
19. List the advantages of digital storage oscilloscope. (2)
20. Differentiate between dual trace and dual beam CRO. (2)

PART – B

1. Describe the construction and working of LCDs, mention the difference between light scattering and field effect types of LCDs, and also explain the advantages of LCDs (16)
2. Give the basic block diagram of a digital data recording system (16)

3. (i) Explain the basic elements of a magnetic tape recorder. (8)
   (ii) Explain the block diagram of oscilloscope with a neat sketch (8)

4. (i) Describe the basic components of a CRT. (10) (ii) Write short notes on liquid crystal displays. (6)

5. (i) With a neat block diagram, explain the working of digital storage oscilloscope. (8)
   (ii) Discuss briefly about the applications of LED. (8)

6. (i) What are the various types of oscilloscopes? (4)
   (ii) Discuss in detail the construction of a storage type oscilloscope. What are the accessories for a CRO? (12)

7. (i) Explain in detail, how the data is stored in a magnetic disk and tape? (10)
   (ii) Describe the performance of digital plotter. (6)

8. (i) Explain the block diagram of a general purpose oscilloscope and also describe about the observation of waveform on CRO. (10)
   (ii) Write short notes on Printers. (6)

9. a) List out the advantages of X-Y records over strip chart recorder. (4)
   b) List the advantages of laser printer. (4)
   c) List the two advantages of digital X-Y recorder. (4)
   d) What is power requirement of LCD? (4)

10. Explain with a neat sketch
    a) Dot matrix displays (8) b) Bar graph displays (8)

UNIT – V

TRANSDUCERS AND DATA ACQUISITION SYSTEMS

PART – A

1. Give the factors to be considered for selecting a transducer. (2)
2. Why is an A/D converter usually considered as an encoder? (2)
3. Define inverse transducer with example. (2)
4. Explain the principle of piezoelectric transducers and name any two piezoelectric materials. (2)
5. Name the transducers used for sensing acceleration. (2)
6. Mention the use of capacitive transducers. (2)
7. Classify the transducers and what is the other name of it. (2)
8. What are active and passive transducers? Give examples. (2)
9. What are the characteristics of transducers? (2)
10. What is meant by data acquisition system? List its types. (2)
11. Give the operating principle of a resistive transducer. Also give some examples (2)
12. What is piezoelectric effect? (2)
13. What is LVDT? (2)
14. List the advantages and disadvantages of LVDT. (2)
15. What is thermocouple? (2)
16. What are the advantages and disadvantages of LVDT? (2)
17. What is seeback voltage? (2)
18. What is strain gauge? List its types. (2)
19. What is gauge factor? Give its expression. (2)
20. What is resistance thermometer? (2)

PART – B

1. (i) Explain the principle of inductive and capacitive transducer. (8)
   (ii) Explain the construction and working of LVDT with a neat sketch (8)

2. (i) Explain different strain gauges with their principle of operation. (8)
   (ii) Discuss in detail about resistive transducers. (8)

3. (i) Explain the various types of temperature transducers. (8)
   (ii) Explain the function of piezoelectric transducer. (8)

4. (i) Explain the binary weighted resistor technique of D/A conversion.(8) (ii) Define the following terms for D/A converters:
   a) Resolution b) Accuracy c) Monotonicity and d) conversion time (8)

5. (i) Explain the resistive transducer with respective to potentiometer. (4)
   (ii) Explain the capacitive transducer. (6)
   (iii) Describe the piezoelectric transducer and give the formula for coupling coefficient. (6)

6. (i) Explain schematic block diagram of a general data acquisition system (DAS) and give its objectives (6)
(ii) Discuss R-2R ladder type D/A converter. (6)
(iii) For a 5 bit ladder, if the input levels are 0 = 0V and 1 = 10V, what are the output
(iv) voltages for each bit? (4)

7. Explain the various types of ADC with suitable sketches. (16)

8. Explain the working principle of various types of DAC with neat sketches. (16)

9. (i) Explain the principle of operation a thermocouple with neat sketch. (10)
   (ii) Give a short note on single and multi channel DAS. (6)

10. (i) Explain the different types of optical encoders. (8)
    (ii) Explain the successive approximation type ADC. (8)
