ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Academic Year : 2018-2019
Department : ECE
Year/Semester : IV YEAR– II SEMESTER
Subject : ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

UNIT-1 PERFORMANCE CHARACTERISTICS OF INSTRUMENTS

1. (a) Give a classification of voltmeters. Explain the working of any one voltmeter in detail. [8]
(b) Explain the following terms in detail (i) Accuracy (ii) Resolution (iii) Precision (iv) Expected value [2]
2. (a) Explain the procedure how to find Errors in Measurement with example [4]
(b) A 200 Ω basic movement is to be used as an ohmmeter requiring full scale deflection of 1 mA and internal battery voltage of 5 V. A half scale deflection marking of 2 k is desired. Calculate
   i. The values of R1 and R2
   ii. Maximum value of R to compensate for a 3% drop in battery voltage [6]
3. (a) Discuss in detail about the range extension of differential voltmeters [4]
(b) The following values are obtained from the measurements of the value of a resistor:147.2 ohms , 147.4 , 47.9 , 147.1 , 147.5 , 147.6 , 147.4 , 147.6 , 147.5 . Calculate a) Arithmetic mean Average deviation Standard Deviation [6]
4. (a) Explain the following terms in detail (i) speed of response (ii) Fidelity (iii) Lag and Dynamic error.[4]
(b) Two ammeters are joined in series in a circuit carrying 100 A. one ammeter has a resistance of 10000 ohm shunted by 0.10 ohm while the other ammeter has a resistance of 150 ohm shunted by 0.02ohm. if the shunts are interchanged what would be the readings of the instruments? [3]
(C) Draw the series type Ohmmeter and explain its operation [3]
5. (a) Draw the Sketch and explain the principle and operation of Thermocouple type Ammeter. [6]
(b) A Voltmeter having a sensitivity of 30k/V reads 80V on a 100V scale, when connected across an unknown resistor. The current through the resistor is 2mA. Calculate the % of error due to loading effect. [4]

UNIT-2 SIGNAL GENERATORS

1. (a) Draw the block diagram of a spectrum analyzer and explain its working. [6]
(b) Distinguish between spectrum analyzer and harmonic distortion analyzer [4]
2. (a) Draw the block diagram of a signal generator and explain its operation. [6]
(b) List out the differences between fixed frequency and variable AF oscillator in detail. [4]

3. (a) Explain the concept of Wien's Bridge method of Harmonic Distortion Analyzer along with circuit diagram. [5]
   (b) What is Heterodyning and explain the use of Heterodyning in spectrum analyzer along with its circuit diagram.[5]
4. (a) Draw the circuit diagram of Sweep generator and explain its operation in detail [5]
   (b) Define a wave analyzer and classify them. Explain the working of a Resonant Wave Analyzer.[5]
5. (a) What is AF oscillators and explain its operation along with circuit diagram. [5]
   (b) Draw the circuit diagram of Digital Fourier Analyzers and explain its operation.[5]

UNIT-3 OSCILLOSCOPES

1. (a) List various types of probes used for CRO. What are active probes used with CRO? Draw the circuit of a FET probe and explain [7]
   (b) Explain the concept of Triggered Sweep CRO along with circuit diagram [3]
2. (a) Draw the circuit diagram of a simple compensated attenuator and explain its working [6]
   (b) An electrically deflected CRT has a final Anode voltage of 2000V and parallel deflecting plates of 1.5cm long and 5mm apart. If the screen is 50cm from the centre of the deflecting plates, Find a) Beam speed Deflection sensitivity of the tube and Deflection factor of the tube.[8]
3. (a) Define deflection sensitivity of a CRT? [2]
   (b) List out the different Features of CRT and Explain the vertical section of CRT along with block diagram [6]
   (c) Explain the basic principal of CRO [2]
4. (a) Explain the Measurement procedure of Lissajous patterns with one example [5]
   (b) Explain the concept, principle working of Storage oscilloscope along with circuit diagram [5]
5. (a) Draw the circuit diagram of Sampling oscilloscope and explain its operation ndetail. [5]
   (b) Draw the circuit diagram of Dual Trace oscilloscope and explain its operation in detail. [5]

UNIT-4 AC BRIDGES

1. (a) Illustrate the method of measurement of unknown inductance by Maxwell's bridge [4]
   (b) List out the different Precautions to be taken when using a Bridge with one example[3]
   (c)A sheet of 4.5 mm thick Bakelite is tested at 50 Hz between 12 cm in diameter. The Schering bridge uses a standard air capacitor C2 of 105 pF capacitor, a nonreactive, R4 of 1000/Π in parallel with a variable capacitor and is obtained with C4 = 0.5 μF and R3 = 260 Ω. Calculate the capacitance, PF and relative permittivity of the sheet [3]
2. (a) Define Quality factor and give the expressions for the inductive and capacitive Quality factors. Explain about a bridge which is used for the measurement of the High Quality factor values.[5]
   (b) Draw the Anderson Bridge and derive the expression for the unknown inductance. What are the salient features of this bridge circuit? [5]
3. (a) Draw the circuit of Wien Bridge and derive the balance condition for bridge. List out the different Limitations of Wheatstone's Bridge in detail [5]
   (b) Draw the circuit diagram of Schering's Bridge and explain the operation of it. [5]
4. (a) In the case of a Schering Bridge, arm Ac has R=4.7kΩ. Arm CD has unknown elements. Arm BD has C=0.1μF Arm AB=4.7KΩ is shunt with 1MF. Determine Values of components is the arm CD. [5]
   (b) Explain the "parallel-connection" method of using Q-meter and Obtain the expressions for resistance, reactance and Q factor.[5]
5. (a) Explain the operation of Maxwell's Bridge and derive the condition for balance of a Bridge.[5]

(b) In the case of Hay's Bridge one arm has resistance of 10KΩ .Another arm has a resistance of 6.7KΩ. The third arm 8KΩ in series with a capacitor of 0.5μF. Determine the Rx and Lx in the fourth arm.[5]

UNIT-5 TRANSDUCERS

1. (a) Explain Primary and secondary Transducers [3]
   (b) Draw the circuit diagram of Photo Transistor and explain its output characteristics [4]
   (c)Explain the different Advantages of Electrical Transducers in detail [3]
2. (a) List out difference between active and passive transducer in detail [5]
   (b) Derive the expression for Gauge factor of a strain Gauge. [5]
3. (a) A Thermistor has a resistance of 3980 at the ice point(0^0 and 749 at 50^0C. The resistance Temperature relationship is $R_T = aR_0e^{b/T}$. Find the values of a and b. Calculate the resistance to be measured in case the temperature varies from 40^0C to 100^0C. [5]
   (b) Define the terms Thermistor Sensistor and explain the importance of thermistor along with advantages of it [5]
4. (a)Draw the Linear variable differential Transducer and explain its operation in detail. [5]
   (b) Explain the Resistive position Transducer along with circuit diagram. [5]
5. (a) List out different types of Strain Gauges used Transducer and explain any one in detail.[5]
   (b) What is the difference between photo-emissive, photo-conductive and photovoltaic transducers? [5]

UNIT-6 MEASUREMENTS OF PHYSICAL PARAMETERS

1. (a) With the help of a neat sketch explain the principle and working of Electromagnetic Flow meter. What are the advantages and Limitations of this Method? [5]
   (b) Briefly explain the working principles and measurement of force by any two nonelectric techniques? [5]
2. (a) Define moisture and explain a method to measure it. [5]
   (b)Explain the working principle of an accelerometer. [5]
3. (a) Define Humidity and give a classification. Explain the procedure for the measurement of humidity. Explain any one of the method for the measurement of humidity? [5]
   (b) Explain in detail about the stroboscope for the measurement of speed. [5]
4. (a) A Barium Titanate pickup has the dimensions of 5mmX5mmX1.25mm. The acting force is 5N. The charge sensitivity of the material is 150pc/N and permittivity is $12.5X10^{-9}$F/m. If the modulus of elasticity of material is $12X10^6N/m^2$, calculate the strain, charge and capacitance. [5]
   (b) What are the two types of anemometer available for liquid flow measurement? Explain the principle and operation of Hotwire Anemometer. [5]
5. (a) Explain piezo electric effect. [3]
   (b) How does pirani gauge differ from thermocouple gauge in operating principle [3]
   (c) Explain the concept of Data acquisition systems in detail [4]
6. Write short notes on the following [10]
   a) Measurement of force
   b) Multi channel DAS

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