

Code No: M0421

R07**Set No. 1**

IV B.Tech. I Semester Regular Examinations, November, 2012
ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Electronics and Communication Engineering)

Time: 3 Hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. a) How will you distinguish between a shunt type ohmmeter and a series type ohmmeter from the dial calibration? How can you estimate the internal resistance of an ohmmeter from its dials?
b) Calculate the value of the multiplier resistance on the 50 V range of a dc voltmeter, that uses a 200 μ A meter movement with an internal resistance of 100 Ω . [10+6]
2. a) Describe the basic elements of function generator and explain the method of producing triangular waves
b) Explain about the AF sine and square wave generator? [10+6]
3. a) State the applications of a spectrum analyzer?
b) Draw the circuit diagram and explain the working of a heterodyne type wave analyzer? [6+10]
4. a) Write the applications of cathode ray oscilloscope?
b) In a CRT, the anode to cathode voltage is 2500V. The parallel deflection plates are 1.5 cm long and spaced 5 mm. The screen is 50 cm from the centre of the deflecting plates. If mass of electron is 9.109×10^{-31} kg and charge on electron 1.602×10^{-19} C. Find (i) the beam speed (ii) The deflection sensitivity of the tube. [8+8]
5. a) State the function and explain the working of a 10:1 probe for a CRO?
b) What are the advantages of using an active probe? [8+8]
6. a) State the Limitations of wheatstone's bridge?
b) The schering bridge has the following constants
Arm AB: Capacitor of 0.5 μ F in parallel with 1 k Ω resistance, Arm BC: Resistance of 3 k Ω Arm CD: Unknown capacitor C_x and R_x in series, Arm DA: Capacitor of 0.5 μ F, frequency 1 kHz. Determine the following (a) Unknown resistance and capacitance
(b) Dissipation factor. [8+8]

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7. a) Derive the expression for strain gauge factor?
b) A resistance strain gauge with a gauge factor of 2 is fastened to a steel member subjected to a stress of 1050 kg/cm^2 . The modulus of elasticity of steel is approximately $2.1 \times 10^6 \text{ kg/cm}^2$. Calculate the change in resistance, ΔR of the strain gauge element due to the applied stress. [8+8]
8. a) What are the factors that decide the configuration of a data acquisition system?
b) With the help of suitable block diagram, explain analog data acquisition system. [8+8]

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1. a) Enumerate the main static characteristics of measuring instruments?
b) Why is a thermocouple measuring instrument classified as an RF instrument? [8+8]
2. Explain the following
a) AF oscillators
b) Random noise generator [8+8]
3. a) With the help of a block diagram, explain an AF wave analyzer?
b) What is the difference between a wave analyzer and a harmonic distortion analyzer? [8+8]
4. a) Give the comparison between dual trace and dual beam oscilloscope?
b) A cathode ray tube, with magnetic deflection, has its screen 22 cm from the centre of the magnetic field. The width of the uniform magnetic field is 3.3 cm and the final anode potential is 6 kV. Calculate the density of the magnetic field to produce a deflection of 4.4 cm on the screen. Take: mass of electron= 9.107×10^{-31} kg; charge on electron = 1.6×10^{-19} C. [8+8]
5. a) What are the different types of CRO probes? Explain briefly
b) Explain the measurement of frequency using Lissajous method. [8+8]
6. a) Derive the equations for balance in the case of Maxwell's inductance capacitance bridge.
b) A four arm a.c bridge a,b,c,d has the following impedances
arm ab: $Z_1=200 \Omega$, 60° (inductive impedance)
arm ad: $Z_2=400 \Omega$, -60° (purely capacitive impedance)
arm bc: $Z_3=300 \Omega$, 0° (Purely resistive) arm cd: $Z_4=600 \Omega$, 30° (inductive impedance)
Determine whether it is possible to balance the bridge under above conditions. [8+8]
7. a) Explain the working of LVDT with neat sketch?
b) Write the principle of working of thermocouple with neat sketch? [8+8]
8. Explain in detail the different methods used for measurement of speed? [16]

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1. a) What are static characteristics? How do they differ from dynamic characteristics?
b) A basic D'Arsonval movement with a full scale deflection of $50 \mu\text{A}$ and an internal resistance of 1800Ω is available. It is to be converted into a 0-1 V, 0-5 V, 0-25 V and 0-225 V multirange voltmeter using individual multimeter for each range. Calculate the values of the individual resistors? [8+8]

2. Write a short note on the following
a) Sweep generator
b) Standard signal generator [8+8]

3. a) Explain the basic wave analyzer with neat sketch?
b) Describe the basic principle of a digital fourier analyzer? [8+8]

4. a) Discuss the working of vertical amplifier with the help of a block diagram?
b) A CRT has an anode voltage of 2 kV and the parallel deflecting plates 2 cm long and 5mm apart. The screen is 30 cm from the centre of the plates. Find the input voltage required to deflect the beam through 3 cm. The input voltage is applied to the deflecting plates through amplifiers having an overall gain of 100. [8+8]

5. a) Describe with the block diagram of a digital CRO for voltage measurement?
b) List out advantages of sampling oscilloscope? [10+6]

6. a) Derive the general equations for balance for an a.c bridge. Prove that two conditions i.e for magnitude and phase have to be satisfied if an a.c bridge is to be balanced unlike a d.c bridge wherein only the magnitude conditions is to be satisfied.
b) A four arm wheatstone bridge a,b,c,d has the following values
arm ab: 1000Ω , arm bc: 2005Ω , arm cd: 200Ω and arm da: 100Ω . The battery voltage is 5 V and its internal resistance negligible connected across ac and the galvanometer has a current sensitivity of $10 \text{ mm}/\mu\text{A}$ and an internal resistance of 100Ω connected across bd. Calculate the deflection of the galvanometer caused by the 5Ω unbalance in arm bc. [8+8]

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7. a) Explain with neat graphs, the characteristics of thermister?
b) Describe the working of capacitive transducer with a neat sketch? [8+8]
8. Explain in detail the different methods used for measurement of force? [16]

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Answer any FIVE Questions
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1. a) Differentiate between the terms accuracy and precision with suitable examples.
b) A 100Ω basic movement is to be used as an ohmmeter requiring a full scale deflection of 1 mA and internal battery voltage of 3 V. A half scale deflection marking of 2 k is desired. Calculate (i) value of R_1 and R_2 (ii) The maximum value of R_2 to compensate for a 5% drop in battery voltage. [8+8]
2. a) What principle is employed for the operation of a function generator?
b) How are broad band sweep frequencies generated using a sweep generator? [8+8]
3. a) Write the principle of working of RF spectrum analyzer?
b) Explain the Wien's and bridged T network method of harmonic distortion analyzer? [8+8]
4. a) Describe the different types of sweeps used in a CRO.
b) Explain the working of dual beam CRO with a neat sketch? [8+8]
5. a) Describe working of oscilloscope used for the range of frequency above 50-300 MHz with a block diagram?
b) State the applications of digital storage oscilloscope? [10+6]
6. a) Explain the working of Q-meter with the help of basic circuit?
b) To check the distributed capacitance of a coil, the coil is resonated at 10 MHz with 120 pF and then is resonated at 15 MHz with 40 pF. What is the inductance of the coil and what is the equivalent distributed capacitance? [8+8]
7. a) Explain the working of Piezo Electric transducers?
b) The output of an LVDT is connected to a 5 V voltmeter through an amplifier whose amplification factor is 250. An output of 2 mV appears across the terminals of LVDT when the core moves through a distance of 0.5 mm. Calculate the sensitivity of the LVDT and that of the whole set up. The millivoltmeter scale has 100 divisions. The scale can be read to 1/5 of a division. Calculate the resolution of the instrument in mm. [8+8]
8. Write a short note on the following?
 - a) Proximity and displacement.
 - b) Data acquisition systems. [8+8]