R13

IV B.Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ELECTRONIC MEASUREMENTS & INSTRUMENTATION
(Electronics and Communications Engineering)

Time: 3 hours   **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) A set of independent current measurements were recorded as 10.03, 10.10, 10.11 and 10.08 A calculate the range of an error. [4]
   b) Mention the different types of distortion. [3]
   c) What will happen when sweep signal is applied to horizontal plates of CRO? [4]
   d) Obtain an expression for series Q meter circuit. [4]
   e) What is a Transducer? Give the classification of transducers. [3]
   f) Draw the block diagram of Digital Data Acquisition System. [4]

PART–B *(3x16 = 48 Marks)*

2. a) What are the dynamic characteristics of measurement systems? Explain. [8]
   b) Draw the Thermocouple type RF ammeter and explain its operation. [8]

3. a) Describe briefly about Harmonic distortion analyzer. [8]
   b) What are the various applications of Digital Fourier Analyzers? [8]

4. a) Explain digital storage oscilloscope with schematic block diagram and state its Applications. [8]
   b) Illustrate why is triggering circuit provided in a CRO? [8]

5. a) Draw the Wien Bridge and derive the expression for the frequency of excitation Signal at balance. [8]
   b) A 1000 Hz bridge has the following constants:
      Arm AB: R=1 kΩ in parallel with C=0.25 μF
      Arm BC: R=1 kΩ in series with C=0.25 μF
      Arm CB: L=50 mH in series with R=200Ω
      Arm DA: Unknown
      Find the constants of arm DA to balance the bridge. Express the result as a pure R in series with a pure C or L, and as a pure R in parallel with a pure C or L. [8]

6. a) Explain the working of Electrical Resistance Thermometer. Also explain four lead method of measuring resistance. [8]
   b) Explain how the piezoelectric transducer can be used to measure force and pressure. [8]

7. a) With neat sketch explain the measurements of proximity. [8]
   b) With neat sketch explain the measurements of humidity and moisture. [8]

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Answer any THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) Define the terms Precision and Resolution of an instrument. [4]
   b) Deduce the difference between a wave analyzer and a harmonic distortion analyzer. [3]
   c) What is the comparison between analog and digital storage oscilloscope? [4]
   d) Distinguish between AC Bridges and DC Bridges. [4]
   e) Discuss about Piezo-electric sensors. [3]
   f) Write short notes on interfacing of transducers with DAS. [4]

PART–B *(3x16 = 48 Marks)*

2. a) Define the following
      (i) Response   (ii) Fidelity   (iii) Lag   (iv) Dynamic error [8]
   b) Draw the circuit diagram of Ohmmeters series type, and shunt type and explain its operation in detail. [8]

3. a) Describe the circuits and working of wave analyzers used for audio frequency and megahertz range. [8]
   b) Describe briefly about Total harmonic distortion. [8]

4. a) Draw the circuit diagram of delay line circuit and explain its operation. [8]
   b) Develop an expression for deflection D in CRO, which is the deflection of the electron beam. [8]

5. a) Analyze Q meter? Explain about its application. [8]
   b) A circuit having an effective capacitance of 160pF is tuned to a frequency of 1.2MHz. In this the current falls to 70.7% of its resonant value when the frequency of an emf of constant magnitude injected in series with the circuit deviates from the resonant frequency by 6KHz. Calculate the Q factor and effective resistance by 6KHz. [8]

6. a) Explain the operation of LVDT. Explain it's merits demerits and applications. [8]
   b) An ac LVDT has the following data:
      Input = 6.3 V, Output = 5.2 V, range ± 0.5 in. Determine
      (i)   Calculate the output voltage vs Core position for a core moment going from + 0.45 in. to − 0.30 in.
      (ii) The output voltage when the core is -0.25 in. from the centre [8]

7. a) With neat sketch explain the measurement of Velocity. [8]
   b) Explain the measurement of force using photoelectric Transducer. [8]

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Code No: **RT42042**

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Set No. 3

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Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
*****

PART–A *(22 Marks)*

1. a) What are the different types of Digital Voltmeter?   [4]
    b) Formulate an equation for the measured value of total harmonic distortion.   [3]
    c) What are the standard specifications of CRO?   [4]
    d) What precautions are required in using bridges?   [4]
    e) Explain the construction of thermocouple.   [3]
    f) Differentiate between a sensor and a Transducer.   [4]

PART–B *(3x16 = 48 Marks)*

2. a) What are the different types of errors in measurement? Explain.   [8]
    b) Describe the working of a series thermos couple type ammeter with schematic
        block Diagram.   [8]

3. a) Define waveform analyzer and explain in detail about frequency selective type
        wave analyzer with block diagram.   [8]
    b) What are the applications of a Spectrum analyzer?   [8]

4. a) Draw the internal structure of CRT and list its functions.   [8]
    b) Explain the frequency and phase measurement using Lissajous figures.   [8]

5. a) Discuss in detail about the principle of Q meter.   [8]
    b) In the case of a Schering Bridge, arm AC has R=4.7 kΩ; Arm CD has unknown
        elements. Arm BD has C=0.1 µF; Arm AB=4.7 kΩ is shunt with 1µF. Determine
        values of components is the arm CD.   [8]

6. a) Explain about Thermistors and Sensistors for the measurement of Temperature.   [8]
    b) A Thermistor has a temperature coefficient of resistance of -0.04 over a
        temperature range of $20^{o}C$ to $60^{o}C$. Find the resistance of the thermistor at $35^{o}C$
        if the resistance of the thermistor at $25^{o}C$ is 100 ohm.   [8]

7. a) Briefly explain the working principles and measurement of force.   [8]
    b) Explain the working of a Multi channel DAS with block diagram.   [8]

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Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
*****

PART–A *(22 Marks)*

1. a) Compare static and dynamic characteristics of measurement systems.   [4]
    b) How does a wave analyzer functionally differ from a spectrum analyzer?   [3]
    c) What are the features of CRT?   [4]
    d) List the factors that cause error in Q meter.   [4]
    e) Explain the characteristics of Thermistors.   [3]
    f) Explain the characteristics of DAS.   [4]

PART–B *(3x16 = 48 Marks)*

2. a) Define the following terms:
        (i) Linearity (ii) Sensitivity (iii) Repeatability (iv) Accuracy   [8]
    b) A basic D' Arsonval moment with a full scale deflection of 50 μA and an
        internal resistance of 1800 Ω is available. It is to be converted into a 0-1 V, 0-5
        V, 0-25 V and 0-225 V multi range voltmeter using individual multipliers for
        each range. Calculate the values of the individual resistors.   [8]

3. a) Discuss the frequency range of different types of signal analyzers.   [8]
    b) Sketch and explain in detail about the Spectrum analyzer.   [8]

4. a) With block diagram and various waveforms at each block, Explain the operation
        of sampling oscilloscope   [8]
    b) List the principle of secondary emission ratio.   [8]

5. a) Explain Anderson bridge with vector diagram and also derives balance Equation.   [8]
    b) How the unknown frequency is measured using Wein's bridge
        method?   [8]

6. a) Explain how the piezoelectric transducer can be used to measure force and
        pressure.   [8]
    b) Explain the working of bonded strain gauge for the measurement of force.   [8]

7. a) With neat sketch explain the principle of operation of Displacement
        measurement.   [8]
    b) A capacitive Transducer has a plate separation of 0.01mm. It's capacitance under
        static condition is 10pF.If the change in capacitance as displacement Transducer
        is accurately measured to be +1pF, Evaluate the displacement.   [8]

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