

**III B. Tech I Semester Regular Examinations, Dec/Jan – 2022-23**  
**ELECTRONIC MEASUREMENTS AND INSTRUMENTATION**  
(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**  
All Questions Carry Equal Marks

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**UNIT-I**

1. a) By using a micrometer screw, the following readings were taken [7M]  
of a certain length: 1.34, 1.38, 1.56, 1.47, 1.42, 1.44, 1.53, 1.48,  
1.40, 1.59 Formulate the necessary equations and calculate the  
following:  
i) Arithmetic mean  
ii) Average deviation  
iii) Standard deviation and  
iv) Variance
- b) Explain the static and dynamic characteristics of measuring [7M]  
instruments.
- (OR)
2. a) List out the different types of errors in measurements and [7M]  
discuss them in detail.
- b) A 200  $\Omega$  basic movement is to be used as an ohmmeter requiring [7M]  
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

**UNIT-II**

3. a) Describe the circuits and working of wave analyzers used for [7M]  
audio frequency and megahertz range.
- b) Discuss the frequency range of different types of signal [7M]  
analyzers.
- (OR)
4. a) Draw and explain the working principle of harmonic distortion [7M]  
analyzer.
- b) Draw the block diagram of a spectrum analyzer and explain its [7M]  
working.

**UNIT-III**

5. a) Explain the procedure to measure the phase and frequency by [7M]  
using Lissajous Pattern.
- b) Compare Active and Passive probes. [7M]
- (OR)
6. a) Describe briefly about various probes used in CROs. [7M]  
b) Compare Sampling, analog storage and digital storage [7M]  
oscilloscope.



**UNIT-IV**

7. a) In case of a Schering bridge, arm AC has  $R=5.5\text{ K}\Omega$ . Arm CD has unknown elements. Arm BD has  $C=1\mu\text{f}$ , Arm AB= $5\text{K}\Omega$  is shunt with  $1\text{MF}$ . Determine values of components in the Arm CD. [7M]  
b) Suggest the suitable bridge for the measurement of self inductance and explain its operation. [7M]

(OR)

8. a) Analyze Q meter? Explain about its application. [7M]  
b) How the unknown frequency is measured using Wein's bridge method? Discuss. [7M]

**UNIT-V**

9. a) Explain the working of Electrical Resistance Thermometer. Also explain four lead method of measuring resistance. [7M]  
b) With neat sketch explain the principle of operation of Displacement measurement. [7M]

(OR)

10. a) What is Piezo-electric effect? Explain the operation of Piezo-electric transducer. [7M]  
b) Explain about Thermistors and Sensistors for the measurement of Temperature. [7M]



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**UNIT-I**

1. a) How are basic instruments converted into higher range ammeter? Illustrate the types of analog ammeter used for instrumentation. [7M]  
b) Draw the circuit diagram of Ohmmeters series type, and shunt type and explain its operation in detail. [7M]  
(OR)
2. a) Define the following terms: [7M]  
(i) Linearity (ii) Sensitivity (iii) Repeatability (iv) Accuracy  
b) A basic D' Arsonval moment with a full scale deflection of 50  $\mu$ A and an internal resistance of 1800 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. [7M]

**UNIT-II**

3. a) Describe briefly about Total harmonic distortion. [7M]  
b) Draw and explain the working principle of random noise generator. [7M]  
(OR)
4. a) Draw the block diagram of an audio spectrum analyzer. Explain its operation. [7M]  
b) Discuss the frequency range of different types of signal analyzers [7M]

**UNIT-III**

5. a) Explain the operation of vertical amplifier used in a CRO. [7M]  
b) Illustrate why is triggering circuit provided in a CRO. [7M]  
(OR)
6. a) With block diagram and various waveforms at each block, Explain the operation of sampling oscilloscope [7M]  
b) Explain digital storage oscilloscope with schematic block diagram and state its Applications [7M]

**UNIT-IV**

7. a) Describe the method of measuring high impedance using Q-meter. [7M]  
b) Explain Anderson bridge with vector diagram and also derive balance Equation. [7M]  
(OR)



8. a) Describe the circuit of Kelvin double bridge used for measurement of low resistance. Derive the conditions for balance. [7M]
- b) An AC bridge has the following constants: [7M]  
Arm AB- Capacitor of  $0.5 \mu\text{F}$  in parallel with  $1 \text{ k}\Omega$  resistance.  
Arm AD- resistance of  $2 \text{ k}\Omega$ .  
Arm DC-Capacitor of  $0.5 \mu\text{F}$ .  
Arm CD-Unknown  $C_x$  and  $R_x$  in series, frequency  $1 \text{ kHz}$ .  
Determine the unknown capacitance and dissipation factor.

**UNIT-V**

9. a) Explain the working of bonded strain gauge for the measurement of force. [7M]
- b) A thermistor has a resistance of  $3980 \Omega$  at the ice point ( $0^\circ\text{C}$ ) and  $1 \text{ k}\Omega$  at  $50^\circ\text{C}$ . The resistance temperature relationship is  $R_T = a R_0 e^{b/t}$ . Find the values of  $a$  and  $b$ . Calculate the resistance to be measured in case the temperature varies from  $40^\circ\text{C}$  to  $100^\circ\text{C}$ ? [7M]

(OR)

10. a) Explain about Thermistors and Sensistors for the measurement of Temperature. [7M]
- b) Briefly explain the working principles of LVDT type accelerometer. [7M]



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**UNIT-I**

1. a) What is meant by PMMC? Explain the working of PMMC meter [7M]  
with help of diagram.  
b) What are the dynamic characteristics of measurement systems? [7M]  
Explain.

(OR)

2. a) Discuss in detail about the range extension of differential [7M]  
voltmeters.  
b) How are basic instruments converted into higher range [7M]  
ammeter? Illustrate the types of analog ammeter used for  
instrumentation.

**UNIT-II**

3. a) Draw the block diagram of a spectrum analyzer and explain its [7M]  
working.  
b) What are the various applications of Digital Fourier Analyzers? [7M]  
Discuss.

(OR)

4. a) Explain the working principle of a harmonic distortion analyzer. [7M]  
b) Explain the working of function generator with block diagram. [7M]

**UNIT-III**

5. a) Develop an expression for deflection D in CRO, which is the [7M]  
deflection of the electron beam.  
b) Draw the circuit diagram of delay line circuit and explain its [7M]  
operation.

(OR)

6. a) Describe briefly about various probes used in CROs. [7M]  
b) An electrical deflected CRT has a final anode voltage of [7M]  
1000V and parallel deflecting plates of 1.5cm long and 5mm  
apart. If the screen is 50cm from the centre of the deflecting  
plates. Find: (i) Beam speed (ii) Deflection sensitivity of the tube  
(iii) Deflection factor of the tube.

**UNIT-IV**

7. a) How the unknown frequency is measured using Wein's bridge [7M]  
method? Explain.  
b) List out different sources of errors and explain the precautions [7M]  
and elimination methods in A.C bridges.

(OR)



8. a) Explain the theory and working principle of Whetstone's Bridge. [7M]  
Derive the relation for finding unknown resistance.
- b) A circuit having an effective capacitance of 160pF is tuned to a [7M]  
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.

**UNIT-V**

9. a) Explain the working of capacitive transducers. [7M]
- b) An ac LVDT has the following data: [7M]  
Input = 6.3 V, Output = 5.2 V, range  $\pm 0.5$  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  
(OR)
10. a) Explain how capacitive transducer can be used to measure the [7M]  
displacement.
- b) Explain the measurement of force using photoelectric [7M]  
Transducer.



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**UNIT-I**

1. a) Give the classification of errors and explain them. [7M]  
b) Two ammeters are joined in series in a circuit carrying 105A. [7M]  
One ammeter has a resistance of  $10000\Omega$  shunted by  $0.10\Omega$  while the other ammeter has a resistance of  $100\Omega$  shunted by  $0.02\Omega$ . if the shunts are interchanged what would be the readings of the instruments?
- (OR)
2. a) What are the dynamic characteristics of measurement systems? [7M]  
Explain.  
b) Draw and explain in detail the shunt type Ohmmeter. [7M]

**UNIT-II**

3. a) What are the different Types of Harmonic Distortions? Define [7M]  
Total Harmonic Distortion (THD).  
b) Draw the block diagram of random noise generator and explain [7M]  
with neat waveforms.
- (OR)
4. a) Describe briefly about Arbitrary waveform generator. [7M]  
b) Illustrate the working of a function generator with a neat block [7M]  
diagram.

**UNIT-III**

5. a) Why triggering circuit is needed in a CRO? Discuss. [7M]  
b) Compare analog storage oscilloscope and digital storage [7M]  
oscilloscope.
- (OR)
6. a) Explain the internal structure of CRT and describe the principle [7M]  
of electrostatic focusing.  
b) Discuss in detail the measurement of frequency by Lissajous [7M]  
method.

**UNIT-IV**

7. a) Draw the circuit diagram of a simple compensated attenuator [7M]  
and explain its working.  
b) With block diagram and various waveforms at each block, [7M]  
Explain the operation of digital storage oscilloscope.

(OR)



8. a) Which active probes are used with CRO? Draw the circuit of a FET probe and explain. [7M]
- b) A 1000 Hz bridge has the following constants: [7M]  
Arm AB:  $R=10k\Omega$  in parallel with  $C=0.5 \mu F$   
Arm BC:  $R=10k\Omega$  in series with  $C=0.5 \mu F$   
Arm CB:  $L=50 \text{ mH}$  in series with  $R=200\Omega$   
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.

**UNIT-V**

9. a) With neat diagram explain potentiometer resistance transducer and list the advantages and disadvantages. [7M]
- b) Differentiate photo-electric and piezo-electric transducers. [7M]
- (OR)
10. a) What is Piezo-electric effect? Explain the operation of Piezo-electric transducer. [7M]
- b) With a neat sketch explain LVDT for velocity measurement. [7M]

