



Name :

Roll No. :

Invigilator's Signature :

**CS/B.TECH(ECE)/SEM-3/EI-302/2010-11
2010-11**

ELECTRONIC MEASUREMENT AND INSTRUMENTATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

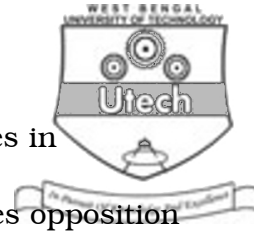
GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) Thermocouple transducer is used for
 - a) Temperature measurement
 - b) Velocity and vibration measurement
 - c) Pressure measurement
 - d) Acceleration measurement.



- ii) The LVDT usually has two secondaries in
- a) series addition b) series opposition
 - c) parallel addition d) parallel opposition.
- iii) Systematic error are
- a) Instrumental errors b) Environmental errors
 - c) Random errors d) both (A) and (B).
- iv) Which of the following bridges is preferred for the measurement of inductance having high Q-factor ?
- a) Maxwell's bridge b) Hay bridge
 - c) Owen bridge d) De Sauty's bridge.
- v) A digital voltmeter measures
- a) peak value b) peak to peak value
 - c) rms value d) average value.
- vi) The gauge factor is defined as
- a) $(\Delta L/L) / (\Delta R/R)$ b) $(\Delta R/R) / (\Delta L/L)$
 - c) $(\Delta R/R) / (\Delta D/D)$ d) $(\Delta R/R) / (\Delta \rho/\rho)$.
- vii) Creeping is observed in
- a) watt-hourmeter b) wattmeter
 - c) ammeter d) voltmeter.



- viii) A spectrum analyzer displays
- different frequency amplitudes w.r.t. time
 - peak-peak amplitude of modulating signal
 - different signal amplitudes w.r.t. frequency
 - Lissajous figures.
- ix) The resolution of a 3 & (1/2) digit DVM having a basic range of 2 volts is
- 2V
 - 1 mV
 - 0.25 V
 - 0.125 V.
- x) A megger is used to measure
- voltage
 - current
 - insulation resistance
 - none of these.
- xi) Frequency can be measured by
- Maxwell's bridge
 - Wein's bridge
 - Campbell bridge
 - Schering bridge.
- xii) The principle of operation of Q-meter is based on
- self inductance
 - mutual inductance
 - series resonance
 - parallel resonance.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. a) State the working principle of PMMC instrument.
b) Describe the method of damping used in this instrument. 2 + 3
3. a) What is Strain gauge ?
b) Derive the expression of gauge factor of a resistance wire strain gauge. 1 + 4
4. Explain how Wein's bridge can be used for measurement of unknown frequencies. Derive the expression for frequency in terms of bridge parameters. 3 + 2
5. A moving coil instrument has the following data :
Number of turns = 100,
Width of coil = 20 mm,
Depth of coil = 30 mm,
Flux density in the air gap = 0.1 Wb/m² .
Calculate the deflecting Torque when carrying a current of 10 mA. Also calculate the deflection if the control spring constant is 2 × 10⁻⁶ N-m/degrees. 5



6. What is piezoelectric effect ? Mention some applications of it.
Name some piezoelectric materials. 2 + 1 + 2

7. a) What is the function of spectrum analyzer ?
b) What is the purpose of function generator ? Draw the
block diagram of function generator. 1 + 1 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. a) Define Point Accuracy.
b) Describe the available techniques of Linearity with
suitable diagram.
c) A set of independent 10 measurements were made to
determine the weight of a lead shot. The weights in gm
were as follows :

1.570, 1.597, 1.591, 1.562, 1.577, 1.580, 1.564,
1.586, 1.550, 1.575.

Determine the arithmetic mean, average deviation,
standard deviation, variance, probable error of one
reading and probable error of the mean. 2 + 5 + 8



9. a) Explain the functional block diagram of CRO with neat diagram.
- b) What is Lissagous figure ? Explain how phase and frequency can be measured using this figures.
- c) What are the differences between CRO dual beam and dual trace ? What is the function of delay line ?

$$7 + (1 + 3) + (3 + 1)$$

10. a) Draw and explain briefly the various blocks of Digital Multimeter.
- b) A $3 \frac{1}{2}$ digit multimeter has an accuracy of $\pm 0.5\%$ reading ± 0.5 counts. If the meter reads 2mA on a full scale of 20 mA, what is the worst case error in reading ?
- c) With the help of a functional block diagram, explain the working principle of a swept TRF spectrum analyzer.

$$6 + 3 + 6$$

11. a) What are the kinds of errors that can occur while measuring low resistance using Wheatstone's bridge ?
- b) State why FETs are used in differential amplifier type of electronic voltmeter.
- c) Explain why compensating coil is used in Electrodynamometer wattmeter ?
- d) Explain how range extension can be achieved in moving coil instruments.

$$3 + 3 + 5 + 4$$



12. Describe how unknown capacitors can be measured using De Sauty's bridge. What are the limitations of this bridge and how can they be overcome by using a modified De Sauty's bridge ? Draw the relevant phasor diagrams. 7 + 8
13. Write short notes on any *three* of the following : $3 \times 5 = 15$
- a) Q-meter
 - b) Signal Generator
 - c) DC-potentiometer
 - d) Dual Slope ADC
 - e) Thermistors
 - f) Wattmeter.
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