



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech/(EEE)Old/PWE(O)/BME(O)/EE(O)/SEM-3/EE-302/2012-13

2012

ELECTRICAL AND ELECTRONICS MEASUREMENT

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)

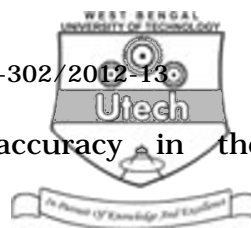
1. Choose the correct alternatives for any *ten* of the following :
 $10 \times 1 = 10$

i) A set of readings has a wide range and therefore it has

- | | |
|------------------|-------------------|
| a) low precision | b) high precision |
| c) low accuracy | d) high accuracy. |

ii) Electrostatic type instruments are primarily used as

- | | |
|---------------|---------------|
| a) ammeters | b) wattmeters |
| c) voltmeters | d) ohmmeters. |



iii) Which meter has the highest accuracy in the prescribed limit of frequency range ?

- a) PMMC
- b) Moving iron
- c) Electrodynamometer
- d) Rectifier.

iv) The burden of C.T. is expressed in terms of

- a) secondary winding current
- b) VA rating of transformer
- c) Voltage, current and power factor of secondary winding circuit
- d) none of these.

v) High resistances are provided with a guard terminal. This guard terminal is used to

- a) bypass the leakage current
- b) guard the resistance against the stray electrostatic fields
- c) guard the resistance against overloads
- d) none of these.



vi) When a potentiometer is used for measurement of voltage of an unknown source, the power consumed in the circuit of the unknown source under null conditions

- a) is very high b) is high
- c) is small d) is identically zero.

vii) Maxwell's inductance-capacitance bridge is used for measurement of inductance of

- a) low Q coils b) medium Q coils
- c) high Q coils d) low & medium Q coils.

viii) In electrodymanometer type wattmeters, current coils designed for carrying heavy currents use stranded wire or laminated conductors

- a) to reduce iron losses
- b) to reduce hysteresis losses
- c) to reduce eddy current losses
- d) all of these.



ix) Creeping in a single phase inductance type energy meter may be due to

- a) over ocompensation for friction
- b) over voltage
- c) vibration
- d) all of these.

x) An aquadag is used in a CRO to collect

- a) primary electrons
- b) secondary emission electrons
- c) both primary and secondary emission electrons
- d) none of these.

xi) Which one of the following is an active transducer ?

- a) Strain gauge
- b) Selsyn
- c) Photovoltaic cell
- d) Photo emissive cell.



GROUP - B
(Short Answer Type Questions)
Answer any *three* of the following.

3 × 5 = 15

2. Derive the expression $\theta = (G / K) I$ in PMMC instrument.
3. a) How is the current range of a PMMC instrument extended with the help of shunts ? 3

b) FIND the multiplying power of a shunt of 200 ohm resistance used with a galvanometer of 1000 ohm resistance. Determine the value of shunt resistance to give a multiplying power of 50. 2
4. Draw the equivalent circuit and phasor diagram of a potential transformer.
5. Derive the expression for measurement of medium resistance by wheatstone bridge.
6. a) Explain the terms resolution and sensitivity of digital meters. 3

b) What is the resolution of a $3\frac{1}{2}$ digit display ? Find the resolution of a $3\frac{1}{2}$ digit meter in case its range is 1V. 2



GROUP - C
(Long Answer Type Questions)

Answer any *three* of the following.

$3 \times 15 = 45$

7. a) Define the terms accuracy, precision, resolution and speed of response. 2 + 2 + 2 + 2
- b) A 0-25 amps ammeter has a guaranteed accuracy of 1% of full scale reading. The current measured by this instrument is 10 amps. Determine the limiting error in percentage. 2
- c) State the three major categories of error. 5
8. Describe the constructional details, working principle and torque equation of an electro-dynamometer type instrument.
9. a) Derive the equations of balance for an Schering Bridge. Draw the phasor diagram for condition under balance. 5 + 2
- b) An ac bridge has the following constants :
 arm ab : capacitor C_1 in parallel with resistance R_1
 arm bc : capacitor of C_3
 arm cd : unknown capacitor C_x and resistance R_x in series.
 arm da : resistance R_2 .

A supply is given between terminal a & c and detector is connected between b & d .

At balance : $C_1 = 0.5\mu\text{F}$, $R_1 = 1\text{K}\Omega$, $R_2 = 2\text{K}\Omega$,
 $C_3 = 0.5\mu\text{F}$.

Determine the value of unknown capacitance, unknown resistance and dissipation factor of this capacitor. Deduce the expression used. 3 + 5



10. a) Explain the construction of Bonded wire strain gauges and derive the expression of gauge factor. 3 + 3
- b) Describe with neat sketches, the construction and working of LVDT. 6
- c) Describe the method for measurement of temperature with use of RTDs. 3
11. Write short notes on any *three* of the following : 3 × 5
- a) Dual slope integrating type DVM
 - b) Wattmeter errors
 - c) Double beam CRO
 - d) Loading effect due to shunt and series connected instruments
 - e) Errors in current transformers.
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