

CS/B.TECH/ECE/EVEN/SEM-6/EC-605C/2015-16



**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**
Paper Code : EC-605C
**ELECTRONIC MEASUREMENT AND
INSTRUMENTATION**

The 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)

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

- i) Which one is not an integrating instrument ?
a) Ampere-Hour meter b) Watt-Hour meter
c) Voltmeter d) All of these.
- ii) Which type of instrument cannot be used for both
ac and dc measurements ?
a) Daynamometer type b) Electrostatic type
c) Induction type d) None of these.

1/60510

[Turn over

CS/B.TECH/ECE/EVEN/SEM-6/EC-605C/2015-16

- iii) A repulsion type ammeter when used in an ac
circuit, reads
a) Peak value current b) RMS value current
c) Mean value d) None of these.
- iv) Maxwell bridge is used to measure
a) Resistance b) Inductance
c) Capacitance d) Frequency.
- v) In a moving iron instrument, 12A current causes a
deflection of the needle by 60 degree. A deflection of
15 degree will be obtained by a current of
a) 9A b) 6A
c) 4A d) 3A.
- vi) An ac voltmeter is used to measure
a) Average value b) RMS value
c) Peak value d) Peak to peak value.
- vii) Spectrum analyzer is a combination of
a) Narrow band superheterodyne receiver and
CRO
b) Signal generator and CRO
c) Oscillator and wave analyzer
d) VTVM and CRO.

6/60510

2

viii) Chopper stabilised dc amplifier is used in voltmeters to measure input voltages in the

- a) kV range
- b) volt range
- c) mV range
- d) microvolt and nanovolt range

ix) Brightness of a CRO is adjusted by controlling

- a) Grid voltage
- b) Anode voltage
- c) Filament current.

x) In measurement system, which of the following static characteristic(s) is (are) desirable ?

- a) Accuracy b) Sensitivity
- c) Reproducibility d) All of these.

xi) In a CRT, the focusing anode is located

- a) between pre-accelerating and accelerating anodes
- b) after accelerating anode
- c) before pre-accelerating anode
- d) none of these.

xii) The resolution of a $3\frac{1}{2}$ digit DVM having a basic range of 2 volts is

- a) 2 V b) 1 mV
- c) 0.25 V d) 0.125 V.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Explain with example the successive approximation type DVM.
3. Explain the working principle of digital frequency meter with the help of a neat diagram.
4. Systematic error can be classified as :
 - a) Instrument errors
 - b) Environmental errors
 - c) Observational errors.

Discuss the above types of errors giving suitable examples. The measures taken to minimize these errors.

5. Ten observations of resistance made in an experiment are 100.4Ω , 99.2Ω , 101.1Ω , 100.5Ω , 99.8Ω , 102.0Ω , 99.9Ω , 101.7Ω , 100.8Ω , 101.2Ω .

Calculate :

- Arithmetic mean
 - Average deviation
 - Standard deviation
 - Variance.
6. Explain the difference between systematic and random errors. What are the typical sources of these two types of errors ? 3 + 2

GROUP – C

(Long Answer Type Questions)

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

- Why low resistances cannot be measured by a Wheatstone's bridge ? Derive the expression for measurement of low resistance by Kelvin's double bridge.
 - With a circuit diagram, explain capacitance and its dissipation factor can be measured by a Schering bridge ? Derive balance.

- The four arms of a bridge are :
 arm ab : an imperfect capacitor C_1 with an equivalent series resistance of r_1
 arm bc : a non-inductive resistance R_3 .
 arm cd : a non-inductive resistance R_4
 arm da : an imperfect capacitor C_2 with an equivalent series resistance r_2 in series with a resistance R_2 .

A supply of 450 Hz is given between b and d . At balance, $R_2 = 4.8 \Omega$, $R_3 = 2000 \Omega$, $R_4 = 2850 \Omega$, $C_2 = 0.5 \Omega$ and $r_2 = 0.4 \Omega$.

Calculate the value of C_1 and r_1 and also of the dissipation factor for this capacitor. (2 + 5) + 5 + 3

- Develop the torque equation of moving coil instrument.
 - A moving coil ammeter has a fixed shunt of 0.02Ω . With a coil resistance of $R = 1000 \Omega$ and a potential difference of 500 mV across it. Full scale deflection is obtained.
 (i) To what shunted current does it correspond ?

(ii) Calculate the value of R to give full-scale deflection when the shunted current I is 20 amp and 60 amp.

(iii) With what value of R is 45% deflection obtained with $I = 100 \text{ A}$?

c) Draw the circuit diagram of an electrodynamic wattmeter with proper labelling. $7 + 5 + 3$

9. a) Explain briefly the operation of dual-slope integration type DVM.

b) Explain the principle of LVDT.

c) A thermistor has a temperature coefficient of resistance of 5% over temperature range 25°C to 50°C is 120Ω . $6 + 5 + 4$

10. a) Write briefly about the construction of an electrodynamic-type instrument.

b) Derive the torque equation of the instrument when an ac current is passed through the coil.

c) List the principle errors of this type of instrument.

$5 + 7 + 3$

11. Write notes on any *three* of the following :

3×5

a) FET input Voltmeter

b) IEEE 488 Interface

c) Anderson Bridge

d) Chopper Amplifier

e) Digital Storage Oscilloscope.

=====