



Name :

Roll No. :

Invigilator's Signature :

**CS/B.Tech(EEE, BME, PWE)/SEM-3/EE-302/2009-10
2009**

ELECTRICAL & ELECTRONIC MEASUREMENTS

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 :

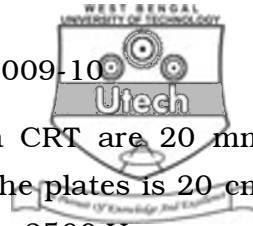
$$10 \propto 1 = 10$$

i) Electrostatic type instruments are primarily used as

- | | |
|---------------|---------------|
| a) Ammeters | b) Wattmeters |
| c) Voltmeters | d) Ohmmeters. |

ii) In an induction type meter, maximum torque is obtained when the phase angle between the two fluxes is

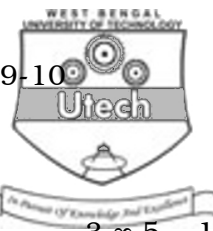
- | | |
|---------------|-----------------|
| a) 0° | b) 45° |
| c) 60° | d) 90° . |



- iii) The horizontal deflection plates in a CRT are 20 mm long and 5 mm apart. The centre of the plates is 20 cm from the screen. Accelerating voltage is 2500 V. The deflection sensitivity is
- a) 0.16 mm/V b) 0.50 mm/V
- c) 0.32 mm/V d) 100 mm/V.
- iv) A high frequency a.c. signal is applied to a PMMC instrument. If the r.m.s. value of a.c. signal is 2 V, the reading of the instrument will be
- a) zero b) 2 V
- c) $2\sqrt{2}$ V d) $4\sqrt{2}$ V.
- v) Which instrument has the lowest resistance ?
- a) Ammeter b) Voltmeter
- c) Frequency meter d) Megger.
- vi) Which of the following instruments is not suitable for measurement of X_L / R of a coil ?
- a) Maxwell's Bridge b) Hay Bridge
- c) Q-Meter d) Schering Bridge.
- vii) Thermistor is used for measurement of
- a) Temperature b) Pressure
- c) Flow d) Displacement.
- viii) Megger is used to measure resistance which is
- a) low b) medium
- c) high d) none of these.



- ix) The time base of a CRO is developed by
- a) square waveform
 - b) saw-tooth waveform
 - c) sine wave waveform
 - d) none of these.
- x) Which meter has the highest accuracy in the prescribed limit of frequency ?
- a) Moving iron
 - b) Rectifier type
 - c) PMMC
 - d) Electrodynamometer.
- xi) In a CRT, the focussing anode is located at
- a) between pre-accelerating and accelerating anode
 - b) after accelerating anode
 - c) before pre-accelerating anode
 - d) none of these.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

$$3 \times 5 = 15$$

2. Define limiting errors. Derive the expression of relative limiting errors. 2 + 3
3. Explain the effect of secondary burden on the ratio and phase errors of a current transformer. Define the terms transformation ratio and nominal ratio. 3 + 2
4. a) Classify resistance from three point of view of measurements.

b) Describe in brief the different methods used for the measurement of resistance. 1 + 4
5. What do you mean by standardisation of potentiometer ?
How is high voltage measured by potentiometer ? 2 + 3
6. Explain with suitable diagram the working of a signal generator. 5
7. Why is a moving coil type instrument unable to measure a.c. ? What type of a scale does a moving iron type instrument have ? Explain the type of damping used. 1 + 1 + 3



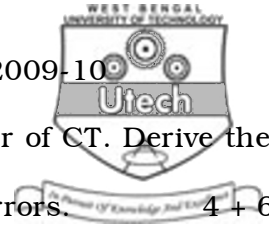
GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.

3 × 15 = 45

8. a) Draw the block diagram of an oscilloscope and explain its major system.
- b) State the function of Sweep Generation circuit in a CRO.
- c) Give the comparison between "Dual trace and Dual beam" Oscilloscopes.
- 8 + 4 + 3
9. a) Describe the construction and working of PMMC type of instrument. Derive the torque equation of MI type of instrument.
- 6 + 4
- b) Calculate the constants of a shunt to extend the range of 0 – 5 A MI ammeter to 0 – 50 A. The instrument constants are $R = 0.09 \, \Omega$ and $L = 90 \, \mu\text{H}$. If the shunt is made non-inductive and the combination is correct on d.c. find the full scale error at 50 Hz.
- 5



10. a) Draw the equivalent circuit and phasor of CT. Derive the expression of ratio and phase angle errors. 4 + 6
- b) A 1000/5 A, 50 Hz CT has a secondary burden comprising of a non-inductive impedance of 1.6Ω . The primary winding has one turn. Calculate the flux in core and the ratio error at full-load. Neglect leakage reactance and assume the iron loss in the core to be 1.5 W at full-load. The magnetizing mmf is 100 A. 5
11. a) Draw and explain with phasor diagram the working principle of Anderson bridge. 5
- b) Describe constructional details of electrodynamic type of wattmeter. 5
- c) The power flowing a 3-phase 3-wire balanced load system is measured by 2 wattmeter method. The reading of wattmeter A is 7500 W and that B is -1500 W . If the voltage of the circuit is 400 V what is the value of capacitance which must be introduced in each phase so that the whole power measured appears on wattmeter A. The frequency is 50 Hz. 5



11. Write short notes on any *three* of the following : 3×5

- a) Electrodynamometer instruments
 - b) Phantom loading
 - c) Megger
 - d) Digital voltmeter
 - e) Drysdale potentiometer.
-