



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(ICE-OLD)/SEM-3/IC-301/2012-13

2012

MEASUREMENT FUNDAMENTALS

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 the following :

$$10 \times 1 = 10$$

i) RTD is an example of transducer.

- | | |
|------------|-------------|
| a) passive | b) active |
| c) analog | d) digital. |

ii) For an overdamped system the damping coefficient is

- | | |
|------------|--------------|
| a) $t < 1$ | b) $t > 1$ |
| c) $t = 1$ | d) $t = 0$. |

iii) A linear potentiometer is a order instrument.

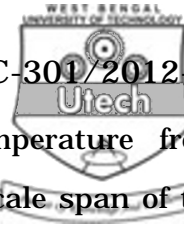
- | | |
|-----------|-----------|
| a) first | b) zero |
| c) second | d) third. |

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[Turn over



- iv) Bourdon gauge is useful to measure the
- a) flow
 - b) level
 - c) force
 - d) temperature.
- v) Dimension of power is
- a) $ML^2 T^{-2}$
 - b) $ML^2 T^{-3}$
 - c) MLT^{-2}
 - d) $ML^2 T^{-1}$.
- vi) The manufacturer specifies
- a) absolute error
 - b) relative absolute error
 - c) guaranteed error
 - d) all of these.
- vii) A 0-10 A ammeter has guaranteed accuracy of 1% of full-scale deflection. The limiting error while reading 2.5 A is
- a) 1%
 - b) 2%
 - c) 4%
 - d) 8%.
- viii) A set of readings has a wide range and therefore it has
- a) low precision
 - b) high precision
 - c) low accuracy
 - d) high accuracy.
- ix) If the standard deviation of any measurement is $\pm 3\sigma$, the probability of occurrence is
- a) 0.6828
 - b) 0.50
 - c) 0.9546
 - d) 0.9974.



x) A thermometer can measure the temperature from -10°C to 100°C . The scale range and scale span of the instrument are respectively

- a) -10°C to 100°C and 100°C
- b) 110°C and 110°C
- c) 100°C and 110°C
- d) all of these.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Describe the signal conditioning circuit in signal measurement system.
3. Calculate the accuracy of measuring 50 V by
 - a) a voltmeter (range 0 – 200 V d.c.) whose accuracy is 0.1% F.S. and
 - b) a voltmeter (range 0 – 100 V d.c.) whose accuracy is 2% of measured value. $2 \frac{1}{2} + 2 \frac{1}{2}$
4. Define the voltage standard. Compare and contrast between saturated and unsaturated Weston cell. $2 + 3$
5. a) What is the difference between sensitivity and dead band of a measurement system ?
 b) What is lag of a system response ?
6. What is meant by direct and indirect method of calibration ? Explain with example.



GROUP - C

(Long Answer Type Questions)

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

7. For normal distribution of data, deduce the expression for probable error in terms of average deviation and standard deviation.

Explain the statement : "A measurement data is specified within $\pm 3\sigma$ limit".

What are the basic methods of rejecting the data ?

$10 + 3 + 2$

8. What are different standards available on total quality management system ? Discuss the structures of different standards.

$5 + 10$

9. Write short notes on any *three* of the following :

3×5

- a) Precision and accuracy
- b) Current standard
- c) Least square method
- d) Reliability of measurement.

10. a) What is the difference between dynamic and static characteristics of an instrument ?

3

- b) Why is analysis of dynamic characteristic essential for a system ?

3

- c) Calculate the following for a first order system of step input :

9

- i) Steady state error
- ii) Dynamic error
- iii) Settling time.

