

Name :
Roll No. :
Invigilator's Signature :

CS/B.TECH (ME)(PE)(N)/SEM-5/ME-504/2012-13

2012

METROLOGY AND MEASUREMENT

Time Allotted : 3 Hours

Full Marks : 70

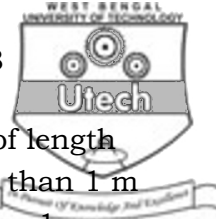
The figures in the margin indicate full marks.

*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 the following : $10 \times 1 = 10$
 - i) The measurement of a quantity
 - a) is an act of comparison of an unknown quantity with another quantity
 - b) is an act of comparison of an unknown quantity with a known quantity whose accuracy may be known or may not be known
 - c) is an act of comparison of an unknown quantity with a predefined acceptable standard which is accurately known
 - d) none of these.
 - ii) A null type of instrument as compared to a deflection type instrument has
 - a) a higher accuracy
 - b) a lower sensitivity
 - c) a faster response
 - d) all of these.



- iii) Gauge block are used for measurement of length
- a) greater than 200 mm b) greater than 1 m
c) less than 200 mm d) less than 1 mm.
- iv) Sine bar should not be
- a) used for measurement of an angle greater than 45°
b) used for measurement of an angle lesser than 45°
c) used for measurement of an angle greater than 45° and if at all they have be used, then sine bar should measure the complement of the angle not the angle than angle itself
d) none of these.
- v) Mechanical comparator have a magnification factor greater than
- a) 10 : 1 b) 100 : 1
c) 1000 : 1 d) 10,000 : 1.
- vi) In a pneumatic comparator, for high value of pneumatic sensitivity the diameter of measuring orifice should be
- a) very large b) large
c) small d) very small.
- vii) Superfine resolution devices for measurement of length include
- a) Vernier calipers
b) Telescoping gauges
c) Pneumatic comparator
d) Interferometers used with special light sources.
- viii) Length standards in the form of blocks or bars, with two faces or ends which are at a defined distance apart are called
- a) End standards b) Line standards
c) Comparators d) Gauges.
- ix) Radiation pyrometers are used in the temperature range of
- a) $0^\circ\text{C} - 500^\circ\text{C}$ b) $500^\circ\text{C} - 1000^\circ\text{C}$
c) $-250^\circ\text{C} - 500^\circ\text{C}$ d) $1200^\circ\text{C} - 2500^\circ\text{C}$.



- x) Semi-conductor thermometers have the disadvantage that they
- are not readily available and are expensive
 - are fragile and have low sensitivity
 - are large in size and have a poor frequency response
 - none of these.

GROUP – B

(Short Answer Type Questions)

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

- What is a transducer ? Explain the active transducer and passive transducer.
- Explain why it is not preferable to use sine bar for measuring angle more than 45° .
- Write the difference between any *two* of the following :
 - Reproducibility and repeatability
 - Precision and accuracy
 - Tolerance and allowance.
- Explain working principle of a strain-gauge load cell.

GROUP – C

(Long Answer Type Questions)

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

- Explain briefly hole basis system and shaft basis system with limits and fits.
 - Determine the dimensions and tolerances of shaft and hole having size of $30 H_7h_8$ fit. Also determine the allowance i.e. minimum clearance and maximum clearance. $7 + 8$
- What is the difference between primary texture and secondary texture ? Describe the various methods of measuring surface roughness.



- b) In the measurement of surface roughness heights of 25 successive peaks and troughs were measured from the datum and were 35, 25, 35, 35, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35, 20, 32, 18 and 40. If the sampling length is 25 mm determine C.L.A. and R.M.S. value. 8 + 7
8. a) Explain with neat sketches the construction and principle of working of a LVDT.
- b) The output of a LVDT is connected to a 4V voltmeter through an amplifier whose amplification factor is 500. An output of 1.8 mV appears across the terminals of LVDT, when the core moves through a distance of 0.6 mm, if the milli-voltmeter scale has 100 divisions and the scale can be read up to $\frac{1}{4}$ of division, calculate
- i) the sensitivity of LVTD
- ii) the resolution of the instrument in mm. 8 + (3 + 4)
9. a) What is a comparator ? How they are classified ? Enumerate the various uses of comparator.
- b) Describe briefly the working principle of back pressure Bourdon gauge pneumatic comparator. 8 + 7
10. a) Describe the arrangement for measurement of actual flow rate with the help of orifice meters.
- b) Derive the expression for the actual flow rate measured by an orifice meter.

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