CS/B.Tech/(AUE-NEW)/SEM-6/AUE-603/2013

2013

METROLOGY & 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
(Objective Type Questions)

1. A. Choose the correct alternatives for the following : 5 × 1 = 5

i) Surface roughness on a drawing is represented by

a) Triangle b) Circle

c) Squares d) Rectangles.

ii) Bevel protector is used for

a) Angular measurement

b) Linear measurement

c) Height measurement

d) Flatness measurement.

iii) A sine bar is specified by

a) weight of sine bar

b) the centre distance

c) the size of the roller

d) the clearance between the roller and upper surface.

iv) 'Lay' in connection with surface finish indicates

a) predominant cut mark

b) direction of surface roughness measurement

c) flaw in the surface

d) none of these.

v) Plug gauges are used to

a) measure the dia of a workpiece

b) check the dia of hole in the workpiece

c) measure the dia of a hole in workpiece

d) check the length of the hole in the workpiece.

B. Answer any *five* of the following questions in brief : 5 × 1 = 5

vi) What do you mean by accuracy ?

vii) What do you mean by feed back ?

viii) How many types of standard are there ?

ix) What do you mean by Load Cell ?

x) What do you mean by closed loop control ?

xi) What do you mean by sensitivity ?

GROUP – B
(Short Answer Type Questions)

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

2. What is the 'best size' wire ? Derive an expression for the same in terms of pitch and angle of thread.

3. Explain the features, principle and use of sine bar.

4. Establish the relationship between the involute function δ and pressure angle φ as given $\delta = \tan \varphi - \varphi$.

5. What do you mean by error ? How many types of error are there ? Explain them properly.

6. What do you mean by dynamic characteristics of an instrument ? Explain properly each of those dynamic characteristics of instrument.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Explain in brief the method of measuring a taper plug gauge by rollers, slip gauges and micrometer. What are the precautions to be taken during the measurement ?

   b) Derive an expression for the error likely to creep in the measurement of angle of taper by this method.

   c) Two taper plug gauges are being measured by this method. In both the cases, dimensions over rollers are measured at the height difference of 100 mm and these values are 80 mm and 8mm respectively with a possible error of 0.005 mm. The angle of taper is 44° for the first and 4.5' for the second. Calculate the errors likely to creep in. What conclusion do you draw from this question ? (3 + 2) + 5 + 5

8. What do you mean by transducer ? How many types of transducer are there ? What are the advantages of transducer ? What do you mean by thermal sensor ? With suitable block diagram ? Explain construction and working principle of thermal sensor. 2 + 3 + 3 + 2 + 5

9. a) With a neat sketch, illustrate how the effective diameter of a screw thread may be checked using 2-wire system. What do you understand by Virtual Effective Diameter of a screw thread ? Show that for a ISO metric thread it is given by VED = $E + 1.732p + 0.0131p\left(\delta\theta_1 + \delta\theta_2\right)$.

   The symbols have their usual meaning.

   b) The following data were obtained in an experiment for testing the dimension of a slip gauge with the help of a reference gauge and a pair of optical flats.

Number of straight and equidistant fringes on each gauge	= 10
Width of each gauge	= 20 mm
Gap between the two gauges placed on optical flats	= 50 mm
Wavelength of light used	= 0.00005mm
Dimension of the reference gauge	= 25 mm

   Determine the dimension of the test gauge (4 + 6) + 5

10. a) What do you mean by DAS ? How many types of DAS are there ? Draw the simple block diagram of a DAS and explain its operation.

   b) An amplifier has a voltage gain of – 120, the feedback ratio is – 0.04. Find out the following :

      i) The voltage gain with feedback

      ii) The feedback in dB

      iii) The out voltage of the feedback amplifier for an input voltage of 40mV

      iv) The feedback factor

      v) The feedback voltage. (3 + 2 + 5) + 5

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

   a) Use of optical flats

   b) Arithmetic mean deviation of roughness (R_a) and ten point height of irregularities (R_z) .

   c) Statistical analysis of data

   d) Static characteristic

   e) Resistive displacement transducer.