(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3991   Roll No. [| | | | | | | | | |]

B.Tech.

(SEMESTER-IV) THEORY EXAMINATION 2012-13

MEASUREMENT & METROLOGY

Time : 3 Hours]   *[Total Marks : 100*

SECTION – A

1. Attempt all question parts : $10 \times 2 = 20$

    (a) State the difference between accuracy and precision of a measurement.

    (b) Give any four methods of measurement.

    (c) What is meant by analog and digital transducer ? Give example.

    (d) What is thermocouple and thermopile ?

    (e) With a aid of sketch explain any one type of elastic pressure transducer.

    (f) What is strain gauge and strain rosettes ?

    (g) What are the various types of linear measuring instruments ?

    (h) How the following are designated ?

        (i) Standard tolerance grade

        (ii) Tolerance size

    (i) Name the different types of interferometer.

    (j) What are the various methods used for measuring the gear tooth thickness ?

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SECTION – B

2. Attempt any **three** question parts : $3 \times 10 = 30$

(a) Discuss in detail :

    (i) the various dynamic characteristics of a measuring system

    (ii) primary and secondary transducer with neat sketch

(b) Briefly explain various methods of measuring torque.

(c) Discuss the construction and working of Optical Pyrometer with neat sketch.

(d) With the aid of neat sketch explain the working of Johansson 'Mikrokator'.

(e) Describe how the straightness error of a Lathe bed is checked using an Auto-collimator.

SECTION – C

Attempt all questions : $5 \times 10 = 50$

3. Attempt any **two** parts : $2 \times 5 = 10$

(a) Draw a sketch showing the movement of sigma comparator.

(b) What is surface texture and give its representation with a sketch ? Also explain about primary and secondary texture.

(c) With neat sketches, explain the significance of some important parameters used for measuring surface roughness. Why so many parameters are needed ?

4. Attempt any **one** part : $1 \times 10 = 10$

(a) What are the basic blocks of a generalized instrumentation system ? Draw the various blocks and explain their functions.

(b) Discuss in detail various types of errors associated in measurement and how these errors can be minimized.

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5. Attempt any **one** part : $1 \times 10 = 10$

   (a) Write short notes on any **two** of the following :

      (i) Stroboscope

      (ii) Vibration pickups and decibel meters

      (iii) Different types of load cells

   (b) Explain the theory of strain gauges and also discuss the temperature compensation in strain gauge.

6. Attempt any **one** part : $1 \times 10 = 10$

   (a) Explain how the component shown in Fig. 1 is checked for its dimensional and form accuracy. Justify the selection of instruments after considering various alternatives possible.
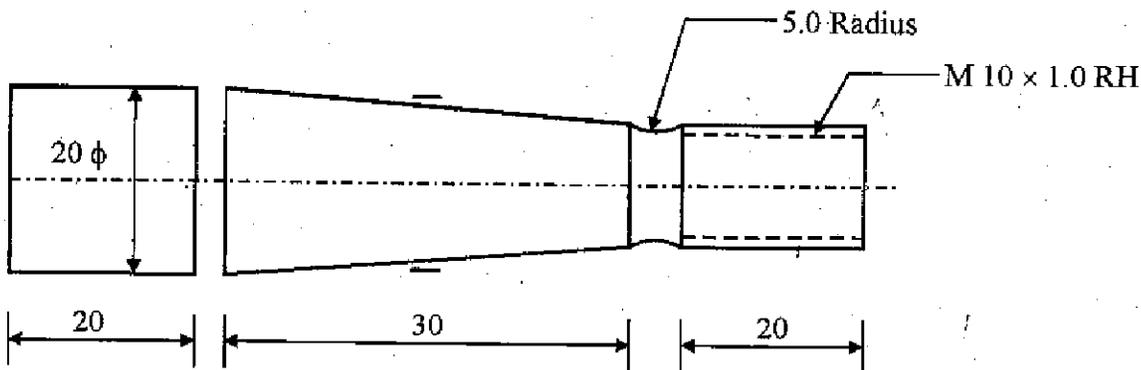

Fig. 1

   (b) Explain Taylor's principle of gauge design. Determine the dimensions of hole and shaft for a fit 30 H_7/h_8. Also determine the allowance and maximum clearance.

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7. Attempt any **two** parts : $2 \times 5 = 10$

(a) Derive the expression for best size wire.

(b) Calculate the length of base tangent over two teeth for a helical gear having the following specification : width of gear = 30 mm, No. of teeth = 10, Helix angle = 30°, pressure angle = 20°, module = 4.

(c) In the measurement of surface roughness, heights of 20 successive peaks and troughs were measured from a datum and were 35, 25, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35, 20 microns. If the measurements were obtained over length of 20 mm, determine the C.L.A and R.M.S value of the rough surface.

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