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Me-604/Metro/6th Sem/2018/J/A

METROLOGY

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instruction :

Answer *all* questions from Part–A and any *nine* questions from Part–B.

PART – A

1. Choose the correct answer for the following :
1×10=10

(a) The measurement refers to

- (i) primary signal
- (ii) measured signal
- (iii) output
- (iv) process variable

[Turn over

(b) In order to check and restore the accuracy of measuring instruments, which of the following is done ?

(i) Alignment test

(ii) Recalibration

(iii) Grinding

(iv) Restarting

(c) Environmental errors may be due to changes in

(i) pressure and temperature

(ii) wind velocity and gravity

(iii) humidity

(iv) all of the above

(d) The instrument used for accurate measurement of external taper is

(i) clinometer

(ii) dial gauge

(iii) sine bar and slip gauges

(iv) combination set

- (e) Which amongst the following devices has maximum accuracy ?
- (i) Vernier caliper
 - (ii) Bevel protector
 - (iii) Dial gauge
 - (iv) Optical projector
- (f) Which of the following materials is/are used to make an angle gauge block ?
- (i) Hardening tool steel
 - (ii) Nickel
 - (iii) Tungsten carbide
 - (iv) All of the above
- (g) Identify the instrument used for surface roughness measurements.
- (i) Profilometer
 - (ii) Combination set
 - (iii) Auto collimator
 - (iv) Optical square

- (h) Surface texture depends to a large extent on
- (i) material composition
 - (ii) type of manufacturing operation
 - (iii) skill of operator
 - (iv) accuracy of measurement
- (i) In wire methods the diameter of the wire selected should be such that it makes contact with the screw along the
- (i) pitch cylinder
 - (ii) outer diameter
 - (iii) root diameter
 - (iv) none of the above
- (j) Random errors can be assessed
- (i) experimentally
 - (ii) statistically
 - (iii) empirically
 - (iv) by performing sensitivity analysis

2. Fill up the blanks with appropriate word(s) of the following : $1 \times 5 = 5$

- (a) Wringing of slip gauges is used in measurement.
- (b) are flat lenses with very accurately polished surfaces that have light transmitting quality.
- (c) Go and No Go gauges are a type of gauges.
- (d) Test are used for checking the true running of the spindle.
- (e) comparators have very high magnification.

3. (i) Mention which of the following statement is true or false : $1 \times 5 = 5$

- (a) Measurement on vernier caliper is more precise than micrometer.
- (b) End standard does not have parallax error.
- (c) Reed comparator is a pneumatic comparator.

(d) Clinometer is an instrument concerned with flatness measurement.

(e) Slip gauges can be wrung together to form desired angles.

(ii) Give one word answer of the following :
1×5=5

(a) The ability of the device to give identical output when repeat measurements are made with the same input signal.

(b) Gradual departure of the instrument output from the calibrated value.

(c) The act of making adjustments of markings on the scale so that the instrument readings conform to an accepted standard.

(d) The ability of two inspectors to obtain consistent results when measuring repeatedly the same part using the same instrument.

(e) The difference between the best measured value and the true value of the quantity.

PART — B

4. Explain any five methods of measurement with suitable examples of each. 5
5. (a) Differentiate between comparator and measuring instrument. 2.5
- (b) State the Taylor's principle of gauge design. 2.5
6. List the minimum number of slip gauges to be wrung together to make an overall dimension of 73.975 mm using a set of 87 pieces. 5

Range (mm)	Steps	Pieces
1.005	—	1
1.001 to 1.009	0.001	9
1.01 to 1.49	0.01	49
0.5 to 9.5	0.5	19
10 to 90	10	9

7. Explain the working principle of an autocollimator with sketches. 5
8. Draw neat sketch of gear tooth vernier caliper and write the procedure for measuring chordal thickness. 5

9. Write the procedure for measuring effective diameter of screw thread using two wire method. 5
10. What are angle gauges ? State the procedure to set the gauges. 2+3=5
11. Describe with sketches the alignment test of lathe centres in vertical plane. 5
12. How internal angle of dovetail can be checked ? List four advantages of mechanical comparator. 3+2=5
13. Write short notes of the following : 2.5×2=5
- (a) Optical square
 - (b) Interchangeability.