



22342

12223

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Illustrate your answers with neat sketches wherever necessary.
  - (4) Figures to the right indicate full marks.
  - (5) Assume suitable data, if necessary.
  - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks****1. Attempt any FIVE of the following :****10**

- (a) State the objectives of Metrology. (Any **four**)
- (b) Define Roughness and Waviness.
- (c) State the advantages of Wavelength Standards.
- (d) State the significance of error 'Backlash' in gear.
- (e) State the types of error found in screw thread.
- (f) Suggest the instruments for measurement of following :
  - (i) Gap of spark plug
  - (ii) Depth of the hole.
- (g) State how the parallelism in two axes is found.



- 2. Attempt any THREE of the following : 12**
- (a) Define Least Count. Explain the procedure for calculating the Least Count of the Vernier calliper.
  - (b) Describe the process of wringing of slip gauges.
  - (c) Describe Selective Fit assembly with suitable example.
  - (d) Explain the Gear Rolling Test bench with neat sketch.
- 3. Attempt any THREE of the following : 12**
- (a) Define :
    - (i) Sensitivity
    - (ii) Readability
    - (iii) Traceability
    - (iv) Calibration
  - (b) Draw the neat labelled sketch of sigma comparator.
  - (c) Differentiate between Hole basis system and Shaft basis system.
  - (d) Describe the various characteristics of precision measuring instruments.
- 4. Attempt any THREE of the following : 12**
- (a) State the various precautions to be taken while using precision measuring instruments.
  - (b) Describe the working mechanism of Dial Indicator with neat sketch.
  - (c) Describe the Taylor's principle of gauge design with suitable figures.
  - (d) Describe the procedure for measurement of Tooth Thickness by Gear Tooth Vernier calliper with neat sketch.
  - (e) Describe the working principle of optical flat. State its limitations.

**5. Attempt any TWO of the following :****12**

- (a) In a hole and shaft assembly of 30 mm nominal size, the tolerance of hole and shaft are as specified below :

$$\text{Hole : } 30^{+0.02}_{-0.000} \quad \text{Shaft : } 30^{+0.040}_{-0.070}$$

Determine : (i) Maximum and minimum clearance

(ii) Allowance

(iii) Hole and shaft tolerance

(iv) MML shaft and hole

(v) The type of fit.

- (b) Draw the neat sketch of Floating Carriage Micrometer. Describe the procedure for measurement of effective diameter with Floating Carriage Micrometer.

- (c) An angle of  $30^\circ - 9' - 15''$  is to be measured with help of the following angle gauges. [ $1^\circ, 3^\circ, 9^\circ, 27^\circ, 41^\circ$ ] [ $1', 3', 9', 27'$ ] [ $3'', 6'', 18'', 30''$ ].

Show the arrangement of angle gauge with a neat sketch by selecting minimum number of gauges.

**6. Attempt any TWO of the following :****12**

- (a) Describe the construction and working of Auto-Collimator with neat sketch. State its applications.

- (b) Describe the construction and working of Taylor's-Hobson-Talysurf with neat sketch.

- (c) Explain the following alignment test carried out on the lathe machine :

(i) Run-out of main Spindle

(ii) Perpendicularity of cross-slide with Spindle axis.

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