



17530

14115

3 Hours/100 Marks

Seat No.

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- Instructions :** (1) **All questions are compulsory.**  
(2) **Illustrate your answers with neat sketches wherever necessary.**  
(3) **Figures to the right indicate full marks.**  
(4) **Assume suitable data, if necessary.**  
(5) **Use of Non-programmable Electronic Pocket Calculator is permissible.**

**MARKS**

1. A) Attempt **any three** : **(4×3=12)**
- a) List any four objectives of metrology.
  - b) Explain the term selective assembly.
  - c) Define :
    - i) Frequency distribution
    - ii) Central tendency
    - iii) Dispersion
    - iv) Variance
  - d) Draw the conventional diagram of limits and fits and define the terms :
    - i) Basic size
    - ii) Fundamental Deviation
- B) Attempt **any one** : **(6×1=6)**
- a) Explain with neat sketch how angle of a workpiece is measured with the help of angle dekkor.
  - b) Draw the neat sketch of Gear tooth vernier calliper and write the procedure for measuring chordal tooth thickness.
2. Attempt **any four** : **(4×4=16)**
- a) In the measurement of surface roughness, heights of 20 successive peaks and valleys measured from a datum are as follows :  
45, 25, 35, 40, 25, 16, 40, 22, 25, 34, 25, 40, 20, 36, 28, 18, 20, 25, 30, 38. If the measurements were made over a length of 20 mm, determine the CLA and RMS values of the surface.
  - b) Construct an angle of  $33^{\circ} 19' 15''$  using minimum number of angle gauges using standard angle gauge set. Draw the sketch of the arrangement.
  - c) What is 'best size of wire' ? State the expression for the same, indicating meaning of each term.
  - d) Draw labelled sketch of Sigma comparator.
  - e) Explain 'cost of quality' and 'value of quality' with the help of graph.

**P.T.O.**

3. Attempt **any four** :

- Differentiate between comparator and a measuring instrument (atleast 4 points).
- Compare inspection and quality control.
- Interpret the meaning of  $27 H_5 F_6$  with respect to fit and basis system.
- Differentiate between Line and End standard. (atleast 4 points)
- Explain in brief two wire method for thread measurement.

4. A) Attempt **any three** :

(4×3=12)

- State different SQC tools and explain any one.
- Why is it necessary to calibrate measuring instruments and unit gauges ?
- Define reliability. State the factors to be considered for achieving a reliable design.
- Explain with neat sketch how angle is measured using clinometer.

B) Attempt **any one** :

(6×1=6)

- Explain the principle and working of Taylor Hobsan Talysurf with block diagram.
- What is LVDT ? Explain its principle of working with neat sketch.

5. Attempt **any two** :

(8×2=16)

- Explain 'Parkinson's Gear Tester'.
- Explain following trends of  $\bar{X}$  control chart.
  - Extreme variations
  - Shift
  - Erratic fluctuations
  - Indication of trend
- Describe with neat sketch :
  - Straightness checking using spirit level.
  - Alignment testing of lathe centres in vertical plane.

6. Attempt **any two** :

(8×2=16)

- Determine the control limits for  $\bar{X}$  and R charts if  $\Sigma \bar{X} = 357.50$  and  $\Sigma R = 9.90$ . Number of subgroups = 20. It is given that  $A_2 = 0.18$ ,  $D_3 = 0.41$ ,  $D_4 = 1.59$  and  $d_2 = 3.735$ . Draw control charts and write your conclusions. Also find the process capability.
- In a manufacturing process, the number of defectives found in the inspection of 10 lots of 400 items each are given below :

Lot no.	1	2	3	4	5	6	7	8	9	10
No. of Defectives	2	0	14	3	1	18	6	0	3	6

Determine the trial control limits for np chart and state whether the process is in control.

- Define TQM. Describe any 3 principal elements of TQM.