17530

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.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. a) **Attempt any <u>THREE</u> of the following:**   **12**

   (i) Define the terms scientific metrology, industrial metrology and legal metrology. Give two applications of legal metrology.

   (ii) State and explain Taylors principle of gauge design.

   (iii) An angle of 32°50′54″ is to be measured using following standards set of [1°, 3°, 9°, 27°, 41°], [1′, 3′, 9′, 27′], [3″, 6″, 18″, 30″] sketch the arrangement with minimum number of gauges.

   (iv) Differentiate between variable control chart and attribute control charts based on any four parameter.

b) **Attempt any <u>ONE</u> of the following:** 6

(i) State comparator is most useful for measuring the roundness and taperness of cylinder bore? Explain its working.

(ii) Write procedure to measure effective diagram of screw thread using two wire method.

2. **Attempt any <u>FOUR</u> of the following:** 16

a) Explain the need of inspection in industries.

b) Explain the following terms related to metrology and give one example:

(i) Selective assembly

(ii) Interchangeability

c) Sine bar is not preferred for measuring an angle more than 45°. State the reason.

d) Draw a neat sketch of gear tooth vernier caliper and write the formula for chordal depth and chordal thickness.

e) Compare 100% inspection with sampling inspection.

3. **Attempt any <u>FOUR</u> of the following:** 16

a) What is wringing of slip gauge? State the condition of wringing.

b) Suggest the instrument which is used to measure the adjacent angle. Explain its principle.

c) State the importance of process capability study in solving quality problem.

d) Suggest the measuring instruments to measure the following features of external and internal threads:

(i) Minor diameter

(ii) Effective diameter

(iii) Pitch

(iv) Thread angle

e) List out the various techniques of qualitative analysis for surface finish. Explain any two.

Marks

4. a) **Attempt any THREE of the following:**   **12**

    (i)   Explain how the squareness of an axis of rotation with a given plane can be tested.

    (ii)   Define assignable causes and chance causes of variation. Give two causes for each of them.

    (iii)   Interpret the meaning of $40H_7i_7$ with respect to fit and basis system.

    (iv)   State the factors to be considered for achieving a reliable design.

  b) **Attempt any ONE of the following:**   **6**

    (i)   Explain the meaning of quality of design and quality of conformance. State the factors controlling the quality of design and quality of conformance.

    (ii)   Explain the double sampling plan with a suitable block diagram.

5.   **Attempt any TWO of the following:**   **16**

  a)   With neat sketch explain the principle of working of linear variable differential transformer. State its application.

  b)   Explain with neat sketch construction and working of Parkinson gear tester.

c) In the lot of 50 pieces, each subgroup is of 05 pieces and for 10 subgroups $\overline{X}$ and R values for the length of pieces is as under.

Sr. No.	$\overline{X}$	R
01	2.12	0.03
02	1.99	0.01
03	1.80	0.02
04	2.00	0.04
05	1.99	0.02
06	2.45	0.01
07	1.85	0.05
08	1.70	0.04
09	1.98	0.06
10	2.30	0.03

Give Data:

$A_2 = 0.577$, $D_3 = 0$, $D_4 = 2.11$, $d_2 = 2.362$

By using general formulae, prepare $\overline{X}$ and R-chart and write the interpretation of chart.

6. **Attempt any TWO of the following:** 16

a) Draw a neat sketch of O.C. curve show the different regions and explain the meaning of four regions.

b) Explain the methodology of system improvement using six sigma. State various certification used in six sigma.

c) (i) State how surface finish is designated on drawing.

(ii) Explain how will you check flatness of work table on a horizontal milling machine.

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