

- (iv) In case of fringes, the dark areas will occur
- When there is no path difference between two light rays
 - When the path difference of two light rays from the same source amounts to an even number of half wavelengths
 - When the path difference of two light rays from the same source amounts to an odd number of half wavelengths
 - None of these
- (v) Outside micrometer is calibrated with the help of
- Inside micrometer
 - Depth micrometer
 - Ring gauges
 - Slip gauges
- (vi) Which one of the instrument is a comparator
- Tool makers microscope
 - GO/NOGO gauge
 - Optical interferometer
 - Dial gauge
- (vii) An autocollimator is used to
- Measure small angular displacements on flat surfaces
 - Compare known and unknown dimensions
 - Measure the flatness error
 - Measure roundness error between enters
- (viii) V -blocks are used
- to test the flatness of a surface
 - to hold cylindrical pieces
 - to hold triangular pieces
 - to measure the roundness of a surface
- (ix) Surface roughness on-a drawing is represented by
- Circle
 - Triangles
 - Square
 - None of these
- (x) Which of the following instruments is used for conducting alignment tests?
- Strain gauge
 - Dial gauge
 - Dynamometer
 - Tachometer

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2. (a) Three 200 mm gauges to be calibrated are measured on a level comparator by wringing them together and then comparing them with a 600 mm gauge, The 600 mm gauge has an actual length of 600.0025 mm, and the three gauges together have a combined length of 600.0035 mm. When the three gauges are intercompared, it is found that gauge A is longer than gauge B by 0.0020 mm but shorter than gauge C by 0.001 mm.

Show the arrangement and determine the length of each gauge.

(2+1.5+1.5=5)

(b) Distinguish between primary, secondary, tertiary, and working standards. (3)

(c) What is inspection? Analyse the economic model for justification of inspection? (1+2=3)

(d) The following are the \bar{X} and R values of 4 subgroups of 5 readings

$$\bar{X} = 10.2, 12.1, 10.8 \text{ and } 10.5$$

$$R = 1.1, 1.3, 0.9 \text{ and } 0.8$$

The specification limits for the components are 10.7 ± 0.2

Calculate to identify the control limits for \bar{X} bar and R chart. Decide whether the

product be able to meet its specifications?

$$A_2 \text{ (Factor of } \bar{X} \text{ chart)} = 0.85,$$

$$D_4 \text{ (Factor of R chart)} = 2.11 \text{ and}$$

$$D_3 \text{ (Factor of R chart)} = 0.00. \quad (2+2=4)$$

3. (a) Tolerances for a hole and shaft assembly having a nominal size of 50 mm are as follows :

$$\text{Hole} = 50 \begin{matrix} +0.02 \\ +0.00 \end{matrix} \text{ mm and shaft} = 50 \begin{matrix} -0.05 \\ -0.08 \end{matrix} \text{ mm}$$

Determine the following :

(i) Maximum and minimum clearances

(ii) Tolerances on shaft and hole

(iii) Allowance

(iv) MML of hole and shaft

(v) Type of fit. (6+1=7)

(b) Illustrate with neat sketch the essential conditions for

(i) Clearance fit

(ii) Interference fit (3 + 3 = 6)

(c) Demonstrate the difference between tolerance and allowance

(1 + 1 = 2)

4. (a) Explain clearly what is meant by interference of light. How does the nature of light source affect interference phenomenon. (2 + 3 = 5)

(b) Explain the method of checking the height of a component with the help of an optical flat. (2 + 2 + 2 = 6)

(c) In the measurement of surface roughness, height of 10 successive peaks and valleys measured from a datum are as follows

$$45, 25, 40, 25, 35, 16, 40, 22, 25, 34$$

The measurements were made of 10 mm, determine C.L.A and RMS value of the surface. (2+2=4)

5. (a) Describe with diagram how the three wire method used in measurement of screw. (7)
- (b) Calculate the effective diameter if : (5)
- (i) The micrometer reading with two wires of standard cylinder 15.64 mm
- (ii) Micrometer reading over the gauge with two wires as 15.26 mm and pitch of thread 2.5 mm.
- (iii) Wires of 2.00 mm diameter and standard cylinder 18 mm.
- (c) What is sine bar? How it is used for angle measurement? (1 + 2 = 3)
6. (a) Explain the measurement of gear tooth thickness by Chordal Thickness Method. (9)
- (b) Describe the working principle of Parkinson Gear Tester. (3)
- (c) Calculate the chord length and its distance below the tooth tip for a gear of module 3 and 20° pressure angle. (3)
7. (a) Discuss the uses of the following : (3)
- (i) Slip gauges (ii) Profile Projector
- (b) How a Co-ordinate Measuring Machine (CMM) helps over a conventional measuring instrument? (4)
- (c) How the following tests would be carried out on a centre lathe : (2+2=4)
- (i) The straightness of the bed, horizontally and vertically
- (ii) The spindle axis parallel to the bed in horizontal plane.
- (d) Describe the working principle of Laser Alignment Testing. (4)

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