

POSTAL Book Package

2023

Mechanical Engineering

Objective Practice Sets

Production and Maintenance Engineering

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Engineering Metrology and Instrumentation

MCQ and NAT Questions

- Q.1** Which one of the following tolerance set on inner diameter and outer diameter respectively of headed jig bush for press fit is correct?
 (a) $G7 h6$ (b) $F7 r6$
 (c) $H7 h6$ (d) $F7 j6$
- Q.2** In the tolerance specification 25 D 6, the letter D represents
 (a) grade of tolerance (b) upper deviation
 (c) lower deviation (d) type of fit
- Q.3** An optical flat measures the flatness of a surface by using principle of
 (a) Dispersion of light
 (b) Interference
 (c) Total internal reflection of light
 (d) Optical contour projection
- Q.4** Which one of the following is used for checking of flatness in the gauge blocks?
 (a) electrical comparators
 (b) optical comparators
 (c) dial gauge
 (d) optical flats
- Q.5** Waviness of a machined surface is caused only by the
 (a) machine tool vibration
 (b) worn out cutting tool geometry
 (c) excessive depth of cut
 (d) excessive heat generation during machining
- Q.6** Which one of the following instruments is used for conducting alignment tests?
 (a) Strain gauge (b) Dial gauge
 (c) Dynamometer (d) Tachometer
- Q.7** Which one of the following is the value for the tolerance grade IT-8?
 (a) $10i$ (b) $16i$
 (c) $25i$ (d) $40i$

- Q.8** Match the **List-I** with **List-II** and select the correct answer using the codes given below the lists:

List-I

- A. Mechanical comparator
 B. Pneumatic comparator
 C. Electrical comparator
 D. Optical comparator

List-II

1. Variable inductance
 2. Dial indicator
 3. Higher accuracy
 4. Air pressure

Codes:

	A	B	C	D
(a)	3	4	1	2
(b)	2	4	1	3
(c)	4	2	1	3
(d)	1	4	3	2

- Q.9** Match the **List-I** with **List-II** and select the correct answer using the codes given below the lists:

List-I

- A. Sine bar
 B. Auto-collimator
 C. Clinometer
 D. Micrometer

List-II

1. Optical principles
 2. Slip gauge
 3. Small linear measurement
 4. Included angle
 5. Compares linear measurement

Codes:

	A	B	C	D
(a)	4	3	5	1
(b)	4	2	3	1
(c)	2	1	4	3
(d)	2	1	5	3

Q.39 The higher limit of a 20 f8 shaft with following data is _____ mm.

$$\text{Given: } i(\text{microns}) = 0.45 D^{1/3} + 0.001D$$

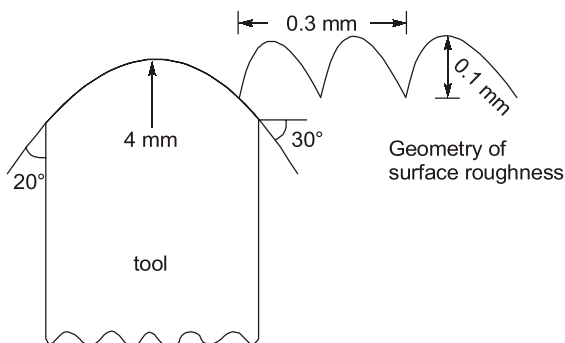
$$\text{Upper deviation of } f \text{ shaft (in microns)} = -5.5 D^{0.41}$$

20 mm falls in diameter step of 18 mm to 30 mm.

$$IT7 = 16i$$

Q.40 In a rectilinear pen recording of a diamond turned surface, a sampling length of 0.8 mm is selected and V/H magnification ratio was 5000/100. The R_a value if the area (in mm^2) above and below datum line are 60, 115, 96 and 92, 109, 70 respectively is _____ μm .

Q.41 A turning tool produces the geometry of surface of workpieces as shown in figure. CLA of the surface produced will be _____ μm .



Multiple Select Questions (MSQ)

Q.42 A hole and shaft have a basic size of 25 mm and have clearance fit with maximum clearance of 0.03 mm and minimum clearance of 0.01 mm. The hole tolerance is 1.5 times the shaft tolerance.

Which of the following is(are) correct for hole basis system?

- (a) Size of hole at minimum material limit is 25 mm.
- (b) Size of hole at maximum material limit is 25.012 mm.
- (c) Size of shaft at maximum material limit is 24.99 mm.
- (d) Size of shaft at minimum material limit is 24.982 mm.

Q.43 A hole and shaft pair is given by 25 mm H_8/d_9 . The fundamental deviation for the shaft can be computed using $-16D^{0.44} \mu\text{m}$. The 25 mm shaft lies in the 18-30 mm diameter step.

Which of the following is(are) correct?

- (a) Hole and shaft pair is having clearance fit.
- (b) Hole and shaft pair is having interference fit.
- (c) Minimum clearance for hole and shaft pair is 63.86 μm .
- (d) Maximum clearance for hole and shaft pair is 148.86 μm .

Q.44 Which of the following statements is(are) correct?

- (a) Straightness and flatness are macroscopic property of surface.
- (b) Wavyness and roughness are microscopic property of surface.
- (c) Straightness is defined as departure of any surface from an ideal reference plane and this plane can be defined by using 3-points.
- (d) Flatness is departure of any surface from an ideal straight line and this line can be drawn by joining the first and the last point.



Answers Engineering Metrology and Instrumentation

1. (b) 2. (c) 3. (b) 4. (d) 5. (a) 6. (b) 7. (c) 8. (b) 9. (c)
 10. (b) 11. (c) 12. (b) 13. (b) 14. (d) 15. (d) 16. (b) 17. (d) 18. (d)
 19. (d) 20. (c) 21. (a) 22. (c) 23. (b) 24. (b) 25. (a) 26. (c) 27. (b)
 28. (b) 29. (c) 30. (c) 31. (1.44) 32. (8) 33. (35.013) 34. (54.46) 35. (7) 36. (7.6)
 37. (42.2) 38. (20.05) 39. (19.980) 40. (1.355) 41. (17.89) 42. (c, d) 43. (a, c, d) 44. (a, b)

Explanations Engineering Metrology and Instrumentation

1. (b)

F7n6 is the tolerance set on inner diameter and outer diameter respectively for headed jig bush for press fit.

2. (c)

The letter 'D' represent lower deviation.

3. (b)

Optical flat is a comparator which is based on the principle of interference.

4. (d)

Optical flats is used for cheeking of flatness in the gauge blocks.

5. (a)

Waviness of a machined surface is caused by machine tool vibration. Waviness refers to those surface irregularities that have a greater spacing than that of roughness width. The greater the width, the smoother is the surface and thus is more desirable.

6. (b)

Application of dial indicator are:

- Centering of workpiece to machine tool spindles.
- Cheeking dimensions
- Aligning a vice on a milling machine
- Off setting lathe tail stocks.

7. (c)

$$\begin{aligned} \text{Tolerance required for "IT8"} &= 10(1.6)(IT_N - IT_6) \\ &= 10(1.6)^{(8-6)} = 10(1.6)^2 = 25i \end{aligned}$$

8. (b)

- Mechanical comparator → Dial indicator
- Pneumatic comparator → Air pressure
- Optical comparator → Higher accuracy
- Electrical comparator → Variable inductance

9. (c)

- Sine bar - slip gauges
- Auto collimator - based on optical principles.
- Clinometer - small included angles.
- Micrometer - small linear measurement.

10. (b)

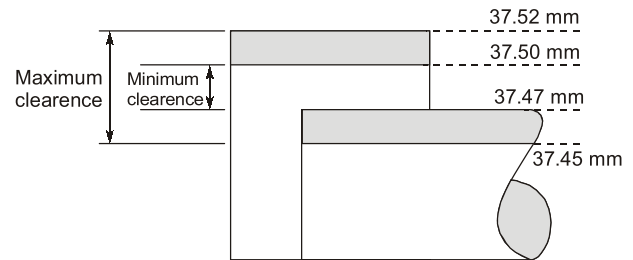
- Feeler gauges - clearance between components
- Slip gauges - end measurement
- Micrometer - line measurement
- Surface plates - flat surfaces

11. (c)

Flaw are irregularities that are present which are random and therefore will not be considered.

12. (b)

Allowance is minimum clearance or maximum interference



$$\text{Allowance} = (37.50 - 37.47) = 0.03 \text{ mm}$$

13. (b)

An engineering ruler is a straight edge designed to measure objects on a construction plant to scale. It has six different scales printed on its prongs and each scale represent different conversion factor.

14. (d)

Universal surface gauge is used for layout work and inspection.

15. (d)

The standard temperature adopted for metrology is 68°F.

17. (d)

Optical projector is used to check profile of a gear tooth.

18. (d)

Taylor's principle of gauging

- A Go gauge will check all the dimension of the work piece in the maximum metal condition (indicating the presence of the greater amount of material permitted at a