

ME 181505

Roll No. of candidate

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4/3/22

2021

BINA CHOWDHURY

ADMR. HODS. - 2020/21
Examination - 2021/22

B.Tech. 5th Semester End-Term Examination

MEIPE

ENGINEERING INSPECTION AND METROLOGY

(NR & NS)

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks for the questions.

Question 1 is compulsory. Attempt any four question from the rest.

1. Multiple choice questions : (10 × 1 = 10)
- (i) The range between the lower and higher values that an instrument is able to measure is called _____.
- (a) precision
(b) repeatability
(c) range
(d) sensitivity
- (ii) Interpretation of repeated measurement results on the same feature is considered the instrument's _____.
- (a) accuracy
(b) precision
(c) hysteresis
(d) resolution
- (iii) When a series of repeated measurements that are made on a component under similar conditions are plotted, it follows _____ distribution.
- (a) binomial
(b) exponential
(c) normal
(d) continuous uniform

[Turn over

- (iv) When a measurement is made between two flat parallel surfaces, it is called _____ standard.
- (a) line (b) end
(c) wavelength (d) parallel
- (v) In the hole and shaft pair designation of 40 H7/d9, the numbers 7 and 9 indicate _____, respectively.
- (a) fundamental deviation of hole and shaft
(b) fundamental deviation of shaft and hole
(c) tolerance grade of hole and shaft
(d) tolerance grade of shaft and hole
- (vi) A hole and shaft pair of dimensions: hole = _____ and shaft = _____ will have _____ fit.
- (a) Clearance (b) Transition
(c) Interference (d) None of the above
- (vii) Maximum material limit corresponds to
- (a) higher limit of a hole and lower limit of the shaft
(b) lower limit of a hole and lower limit of the shaft
(c) higher limit of a hole and higher limit of the shaft
(d) lower limit of a hole and higher limit of the shaft
- (viii) The direction of the predominant surface pattern, ordinarily determined by the production process used for manufacturing the component, is referred to as _____.
- (a) Flaws (b) Lay
(c) roughness (d) Waviness
- (ix) The collimating lens in an interferometer is used for _____.
- (a) making the light rays parallel
(b) focusing the light rays at a point
(c) filtering the light rays
(d) diverging the light rays

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- (x) The surface roughness on a drawing is represented by _____
- inverted triangle
 - square
 - circle
 - waves
2. (a) In a hole and shaft assembly of 10 mm nominal size, the tolerances are specified as Hole: and shaft: Determine (5)
- Maximum and minimum clearance
 - Hole and shaft Tolerance
 - Type of fit
 - Maximum Material limit (MML) of the shaft, and
 - Least material limit (LML) of the hole.
- (b) Design the general type of GO and NO-GO gauge for components having 25 H7/f8 fit, given that (10)
- 25 mm falls in the diameter step of 18-30mm
 - IT8 = 25i
 - IT7 = 16i
 - upper deviation = $-5.5D^{0.41}$
 - wear allowance assumed to be 10% of gauge tolerance.
3. (a) Illustrate a method to determine the effective diameter of a screw using two identical wires and a screw gauge micrometer. Derive the diameter of the best size wire when using two wire method. (7+4)
- (b) A metric screw thread is being inspected using the two-wire method to measure its effective diameter, and the following data is observed: Pitch = 2 mm, diameter of the best-size wire = 0.78mm, and distance over the wires = 25.18mm. Determine the effective diameter of the screw thread. (4)

4. (a) Give an example of chance cause, assignable cause, conforming, and conformities. State the charts used for the conforming and conformities data in statistical process control. (2+2)
- (b) Mean, and range charts are used to control the dissolved iron content of a dyestuff formulation in parts per million (ppm). After 30 subgroups of 6 measurements, the following data has been obtained. (7)

$$\bar{x}_i = 462 \text{ and } R_i = 30$$

where \bar{x}_i = mean of i th subgroup

R_i = range of i th subgroup

(Given for $n = 6$, $d_n = 2.534$)

Design the appropriate control mean charts.

- (c) Discuss the different types of errors in spur gear measurement. (Any 4) (4)
5. (a) Briefly explain the phenomenon of interference. Explain the working of a NPL Flatness interferometer. (3+5)
- (b) Find the R_a value for the profile having peak areas of 250 mm^2 , 150 mm^2 , 100 mm^2 , and valley area as of 75 mm^2 , 175 mm^2 , 50 mm^2 . The sampling length is 0.8 mm , and the vertical magnification is 100, and the horizontal magnification is 10. (4)
- (c) State the difference between roughness and waviness. (3)
6. (a) State Taylor's principle for gauging. Demonstrate the working of a GO-NO GO plug gauge. (4)
- (b) Discuss coordinate measuring machine (CMM)? Report the advantages of a CMM over a conventional measuring instrument? Identify the technical parameters by which a CMM can be specified? (5+3+3)
7. Discuss with short notes: (any three) (3×5=15)
- Sigma Comparator
 - Line, end, and wavelength standard
 - dial gauge as a comparator
 - Tomlinson surface meter
 - Significance of sampling
 - Interchangeability

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 25 JMT & 3 IPS
 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
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