

KATHMANDU UNIVERSITY
End Semester Examination
July/August 2024

Level : B.E.
Year : II
Time : 2 hrs. 30mins.

Course : MEEG 219
Semester : I
F. M. : 55

SECTION "B"

Attempt *ALL* questions.

1. Explain the primary differences between line standard, end standard, and wavelength standard in metrology. Discuss how each standard is utilized in ensuring accurate measurements, and provide examples of their practical applications. [5]
2. Write difference between [4 × 1.5= 6]
 - a. Absolute Error and Relative Error
 - b. Gross Error and Systematic Error
 - c. Unilateral Tolerance and Bilateral Tolerance
 - d. Sensitivity and Resolution
3. A shaft is manufactured with a nominal diameter of 50 mm. The maximum metal limit is 50.05 mm, and the minimum metal limit is 49.95 mm. Calculate the tolerance range for the shaft and determine whether a shaft with a diameter of 49.96 mm would be acceptable according to these limits. [1+1= 2]
4. Explain the concept of the hole basis system and the shaft basis system in the context of engineering fits. How do these systems achieve different types of fits? Support your explanation with appropriate diagrams. [4]
5. How does the presence or absence of graduated markings impact the usage and accuracy of metrology instruments? [3]
6. List the characteristics of precision measuring instruments. [3]
7. Explain Go and No-Go Gauge. [2]
8. Define Angle. Explain the constructional features of a Sine Bar. Explain the working principle of an Auto-collimator for angular measurement, including a suitable figure. [1+2+3=6]
9. Explain the different classification of screw threads. Provide examples to illustrate the characteristics and typical uses of each type. [3]
10. Explain different types of pitch error in the screw thread with suitable figures. [4]
11. List different types of techniques used for the measurement of surface finish using the inspection by comparison method. Explain the working principles of the Tomlinson Surface Meter for the measurement of surface finish. Include a suitable figure. [2+4]

P.T.O.

12. Define positive zero error and negative zero error when using a micrometer for linear measurement. Discuss methods to identify and correct these errors to ensure precise measurements. Support your explanation with suitable figures. [4]
13. What is the basic difference between radial runout and axial runout in spur gear measurement? [2]
14. List various methods used for the measurement of gear tooth thickness and explain one of them in detail. [1+4]

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Marks Scored:

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Registration No.:

Course : MEEG 219

Semester : I

F. M. : 20

Date

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SECTION "A"

[20Q. × 1 = 20 marks]

Choose and mark [X] in the most appropriate option from each set of choices

- Which type of gear transmits motion between two intersecting shafts?
 Bevel Spur Helical Worm
- What is the term for the process of ensuring measurement instruments are providing accurate results?
 Calibration Validation Estimation Standardization
- What is the primary purpose of a slip gauge in metrology?
 To measure internal dimensions
 To measure angles
 To provide accurate reference dimensions
 To measure depth
- The term 'Allowance' in limits and fits is usually referred to
 Minimum clearance between shaft and hole
 Maximum clearance between shaft and hole
 A difference in tolerance of hole and shaft
 Difference between maximum size and minimum size of the hole
- A shaft and hole system has a nominal size of 50 mm. The hole has a tolerance of ± 0.05 mm, and the shaft has a tolerance of ± 0.05 mm. What is the range of possible clearances or interferences between the shaft and the hole?
 0.00 mm to 0.10 mm -0.10 mm to 0.00 mm
 -0.10 mm to 0.10 mm -0.05 mm to 0.05 mm
- What type of error in thread measurement might resemble a wave-like pattern when plotted against the length of the thread?
 Periodic errors Progressive errors
 Irregular errors Drunken errors
- What is the function of the locking screw on a depth gauge?
 To hold the measurement spindle in place
 To adjust the zero point
 To increase measurement accuracy
 To measure angles

8. For which type of gear teeth profile is the primary advantage the ability to maintain a constant pressure angle during meshing?
 Cycloidal Asymptotes Involute Epicycloidal
9. Which part of a micrometer is responsible for making fine adjustments to the measurement?
 Anvil Frame Spindle Thimble
10. Which term describes the smallest change in the quantity being measured that causes a perceptible change in the reading of an instrument?
 Sensitivity Resolution Drift Hysteresis
11. What does allowance represent in transition fits?
 It represents minimum clearance and is positive
 It represents maximum clearance and is positive
 It represents minimum interference and is negative
 It represents maximum interference and is positive
12. Which of the following statements is/are **FALSE** regarding the effective diameter of a screw thread?
 The effective diameter is the diameter where the width of the thread ridge and thread groove are equal.
 The effective diameter is used to determine the fit between mating threads.
 The effective diameter is not affected by the thread profile.
 The effective diameter is critical for ensuring proper thread engagement and strength.
13. Which of the following measurements is least likely to be directly measured using conventional thread gauges and requires an indirect method for accurate determination?
 Major diameter of an external thread
 Minor diameter of an internal thread
 Effective diameter of an external thread
 Major diameter of an internal thread
14. Which of the following errors is most likely to result from improper mounting of a spur gear on its shaft?
 Pitch error Axial runout
 Tooth profile error Radial runout
15. What is the purpose of the contact point on a dial indicator?
 To hold the indicator securely in place
 To magnify the measurement reading
 To provide a reference for measurement
 To make physical contact with the measured surface
16. Which diameter passes through the points of contact of the teeth when two gears are properly meshed and transmitting motion?
 Base circle Root circle Pitch circle Addendum circle

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17. What effect does pitch error have on nut and bolt?
 Major diameter of nut decreases and effective diameter of bolt increases
 Effective diameter of nut decreases and effective diameter of bolt increases
 Effective diameter of nut increases and effective diameter of bolt decreases
 None of the above
18. Expressing a dimension as $50 \begin{matrix} +0.00 \\ -0.05 \end{matrix}$ mm is the case of
 Unilateral tolerance Bilateral tolerance
 Limiting dimensions None of the above
19. In hole basis system, basic size is equal to
 maximum hole size minimum hole size
 upper deviation which is zero none of the above
20. Which instrument is desired to measure small angular deflections?
 Sine bar Clinometer
 Auto-collimator Spirit level

