KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2025

Marks Scored:

Level : B.E.
Year : II

Course : MEEG 219
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 13 APR 2025

SECTION "A"
[20Q. × 1 = 20 marks]

Choose the most appropriate answer and **mark [X]**.

1. Which of the following best describes the primary function of an instrument in a scientific or industrial context?
   [ ] To process data and provide a final result.
   [ ] To generate energy or power for operations.
   [ ] To measure, monitor, or control physical quantities.
   [ ] To store data for future analysis

2. The least count of a dial indicator is:
   [ ] The smallest value that the dial indicator can measure in one revolution
   [ ] The maximum displacement the indicator can measure
   [ ] The smallest division on the dial scale
   [ ] The difference between the scale reading and the dial reading.

3. In a micrometer, if the reading shows 0.03 mm even when there is no object between the measuring faces, what does this indicate?
   [ ] Positive error [ ] Negative error [ ] Zero error [ ] Parallax error

4. Which part of a micrometer is responsible for making fine adjustments to the measurement?
   [ ] Anvil [ ] Frame [ ] Spindle [ ] Thimble

5. Which characteristic of an instrument describes its ability to maintain consistent accuracy over a range of values?
   [ ] Sensitivity [ ] Linearity [ ] Drift [ ] Hysteresis

6. Which of the following fits would be most appropriate when designing a bearing assembly where the needs to be a slight gap for lubrication but not too much movement?
   [ ] Transition fit [ ] Interference fit [ ] Loose fit [ ] Clearance fit

7. The absolute error in the measurement of the mass of a sample is 0.2 grams. If the actual mass is 50 grams, what is the relative error in percentage?
   [ ] 0.4% [ ] 4% [ ] 2% [ ] 0.02%

8. Which of the following is true about the hole basis system?
   [ ] The size of the hole is fixed, and the size of the shaft varies
   [ ] The size of the shaft is fixed, and the size of the hole varies
   [ ] Both the size of the hole and shaft are fixed
   [ ] The hole and shaft sizes are variable

9. Which of the following would be an example of indirect measurement in metrology?
[ ] Measuring the direct length of a steel rod using a micrometer
[ ] Using a scale to weight a component in a lab
[ ] Measuring the thickness of a film by measuring the difference in height using a dial gague
[ ] Measuring the weight of an object using a balance

10. You are using a Type K thermocouple connected to a temperature meter with low precision for measuring the temperature of boiling water. The theoretical boiling point is 100 °C, the meter reads 102 °C. The manufacturer specifies the thermocouple error to be ± 2 °C. What is the maximum possible error in the reading?
[ ] ±0.5 °C [ ] ± 2 °C [ ] ±4 °C [ ] ±0.1 °C

11. An instrument has a range of 0-100 units. If the input signal exceeds this range, what is most likely to happen?
[ ] The instrument will continue to display readings, but with increasing error.
[ ] The instrument will saturated and produce a constant output for inputs beyond 100 units.
[ ] The instrument will automatically adjust its range to measure higher values.
[ ] The instrument will display an error code indicating the signal exceed the range.

12. In screw thread measurement using a profile projector, which of the following factors most significantly affects the accuracy of measuring the thread angle?
[ ] The distance between the screw threads.
[ ] The magnification level of the profile projector lens.
[ ] The pitch of the screw thread.
[ ] The surface roughness of the screw thread.

13. In context of a digital thermometer, what does the sensitivity of the instrument refer to?
[ ] The temperature range the thermometer can measure.
[ ] The smallest temperature change the thermometer can detect and display.
[ ] The accuracy of the thermometer in maintaining constant readings.
[ ] The time taken for the thermometer to stabilize after being switched on.

14. The allowance between a shaft and a hole is the difference between:
[ ] The maximum material limit of the shaft and the minimum material limit of the hole
[ ] The minimum material limit of the shaft and the maximum material limit of the hole
[ ] The average diameter of the shaft and the hole
[ ] The maximum diameter of the hole and the minimum diameter of the shaft

15. Radial runout in a spur gear refer to:
[ ] The variation in the tooth profile along the length of the gear
[ ] The variation in the distance between the gear teeth
[ ] The deviation of the pitch circle from its ideal position
[ ] The variation in the radial distance between the center of the gear and the point of measurement as it rotates.

16. Square threads are mainly used in:
[ ] Fasteners [ ] Power transmission applications
[ ] High-speed rotating machinery [ ] Gear drives

17. In a double-start screw with a pitch of 3 mm, what would the lead be?
[ ] 3 mm [ ] 6 mm [ ] 9 mm [ ] 1.5 mm

18. When using a stylus-type surface profilometer, the skid should be set to:
[ ] Maintain a constant contact force between the stylus and the surface
[ ] Ensure the stylus moves only in the X-direction
[ ] Reduce the wear on the stylus by keeping it from touching the entire surface
[ ] Allow for vertical displacement of the stylus during measurement

19. In screw thread terminology, the flank refers to:
[ ] The outermost part of the thread
[ ] The surface of the thread from the crest to the root
[ ] The angle between the axis of the screw and the thread profile
[ ] The innermost diameter of the thread

20. When using a bevel protractor, the blade is used to:
[ ] Provide support to the instrument during measurement
[ ] Set the desired angle on the scale
[ ] Lock the protractor at a specified angle
[ ] Move the workpiece during measurement

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SECTION "B"

Attempt ALL the questions.

1. Explain the Yard with a suitable diagram. [3]

2. Compare Line Standard and End Standard based on their characteristics. [4]

3. List ten different static characteristics of an instrument and define any four. [2+4]

4. Why is the concept of limits, fits, and tolerance important in product design and development? Explain with a suitable example and figure. [5]

5. List different characteristics of precision measuring instrument. [3]

6. Explain the working principal of Vernier height gauge with a suitable diagram. [5]

7. Define Angle. Explain how a sine bar and a clinometer are used for angular measurement with a suitable diagram. [1+6]

8. Define Lay. List the different types of lay in surface finish with suitable diagrams. [3]

9. Explain the working principal of the Tomlinson Surface Meter with a suitable diagram. [5]

10. Explain the screw thread in terms of the direction of rotation. Explain two different methods used for measuring the minor diameter of internal screw thread with suitable diagrams. [2+4]

11. Explain the different types of pitch errors in screw threads with figures. [4]

12. Label the different terminologies used in a spur gear with a suitable diagram. [4]