KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Marks scored:

Level : B.E.
Year : II
Course : MEEG 219
Semester : I
Exam. Roll No.:
Time: 30 mins.
F.M. : 20
Registration No.:
Date 07 JUN 2019

SECTION "A"
[20Q. × 1 = 20 marks]

Choose the most appropriate answer and mark [X].

1. _____ are those associated with the measuring instrument's capabilities, environment and other extraneous conditions, which are generally controllable or, at least, measurable.
[ ] Systematic errors [ ] Random errors
[ ] Calibration errors [ ] Environmental errors

2. The ability by which a measuring device can detect small differences in the quantity being measured by it, is called its_____.
[ ] damping [ ] sensitivity
[ ] accuracy [ ] none of the above

3. Length is expressed as the distance between two flat parallel faces in _____.
[ ] line standard [ ] end standard
[ ] wavelength standard [ ] all of the above

4. _____ is the ability to give same value every time the given quantity is measured.
[ ] Repeatability [ ] Precision [ ] Reproducibility [ ] Accuracy

5. The least count of a Vernier caliper having 50 divisions on Vernier scale, matching with 49 main scale divisions (1 main scale division = 1 mm) is
[ ] 0.05 mm [ ] 0.01 mm [ ] 0.001 mm [ ] 0.02 mm

6. In a micrometer, the zero mark on the main scale is clearly seen and the circular scale reads 10 divisions when the micrometer is completely closed. What type of error does the micrometer possess?
[ ] No zero error [ ] Positive zero error
[ ] Negative zero error [ ] Could be positive or negative error

7. A push fit is _____ fit.
[ ] interference [ ] clearance [ ] transition [ ] tight

8. What does allowance represent in clearance fits?
[ ] It represents minimum clearance and is positive
[ ] It represents maximum clearance and is positive
[ ] It represents minimum clearance and is negative
[ ] It represents maximum clearance and is negative

9. Following is the theoretical size which is common to both the parts of a mating pair.
[ ] Nominal size [ ] Actual size
[ ] Basic size [ ] All of the above

10. Principle of GO and NO-GO gauges state that
[ ] Both MMC and LMC should be covered by GO gauge.
[ ] Both MMC and LMC should be covered by NO-GO gauge.
[ ] MMC should be covered by GO gauge and LMC should be covered by NO-GO gauge.
[ ] MMC should be covered by NO-GO gauge and LMC should be covered by GO gauge.

11. The following is used to check the diameters of holes.
[ ] Plug gauge [ ] Ring gauge
[ ] Snap gauge [ ] Filler gauge

12. A _____ gear transmits motion between two shafts which are intersect.
[ ] spur [ ] bevel [ ] helical [ ] worm

13. The _____ tooth is derived from the curve traced by a point on the circumference of a circle as the circle rolls without slipping on a straight line.
[ ] helical [ ] cycloidal [ ] involute [ ] worm

14. _____ are designed to handle heavy force in one direction.
[ ] Acme thread [ ] Knuckle thread [ ] Matric thread [ ] Buttress thread

15. Which thread parameter can be measured using taper parallels with micrometer?
[ ] Minor diameter of external thread
[ ] Major diameter of external thread
[ ] Minor diameter of internal thread
[ ] major diameter of internal thread

16. What is the least count of a universal bevel protector?
[ ] One degree [ ] One minute [ ] Five minutes [ ] Five seconds

17. A 100 mm sine bar is to be set up to an angle of 33°, determine the required height of the slip gauge.
[ ] 51.862 mm [ ] 54.464 mm [ ] 50 mm [ ] 45.536 mm

18. Surface texture greatly affects _____.
[ ] functionality of the parts [ ] load carrying capacity
[ ] impact and fatigue life [ ] all of the above

19. Peaks and valleys were measured on a surface and five representative observations were: +34 μm, +12 μm, -28 μm, +16 μm and -12 μm. (+ve represents peaks and –ve represents valleys) What is the maximum surface height of the profile (R_t)?
[ ] 4.4 μm [ ] 20.4 μm [ ] 62 μm [ ] 12.4 μm

20. Which one of the following error doesn't exist in thread?
[ ] Parallel error [ ] Progressive error [ ] Drunken error [ ] Irregular error

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SECTION "B"

Attempt *ALL* questions.

1. Accuracy is very often confused with precision. How do you differentiate precise and accurate measurement data? Does precision ensure accuracy? [3]

2. State the characteristics of measuring instruments that a metrologist should know before using any measuring instruments for measurement. [3]

3. What do you understand by line and end standard? Explain how wavelength standard helped to overcome problems associated with line and end standard. [4]

4. Write short notes on (*ANY FOUR*): [4 × 1.5 = 6]
   a. Environmental errors
   b. Direct measuring instruments
   c. Calipers
   d. Feeler gauges
   e. Auto-collimator
   f. Combination set

5. A sheet metal micrometer with a pitch of 0.5 mm and a circular scale with 50 divisions is used to measure the thickness of a thin sheet of Aluminum. Before starting the measurement, it is found that when the two jaws of the screw gauge are brought in contact, the 45^{th} division coincides with the main scale line and that the zero of the main scale is barely visible. Determine least count and error of the micrometer. What is the thickness of the sheet if the main scale reading is 0.5 mm and the 25^{th} division coincides with the main scale line? [4]

6. Between two mating parts of 100 mm basic size, the actual interference fit is to be from 0.05 mm to 0.12 mm. The tolerances for hole is the same as the tolerance for the shaft. Find the size of both the shaft and the hole on hole basic unilateral system. Illustrate the limit system of the mating parts in diagram. [3]

7. Discuss how bevel protector gives more precise angular measurement than normal protector. Bevel protector is used to measure unknown angle and the observed measurement on the bevel protector is shown in Figure 1 below. Evaluate least count of the bevel protector and the measured angle. [4]

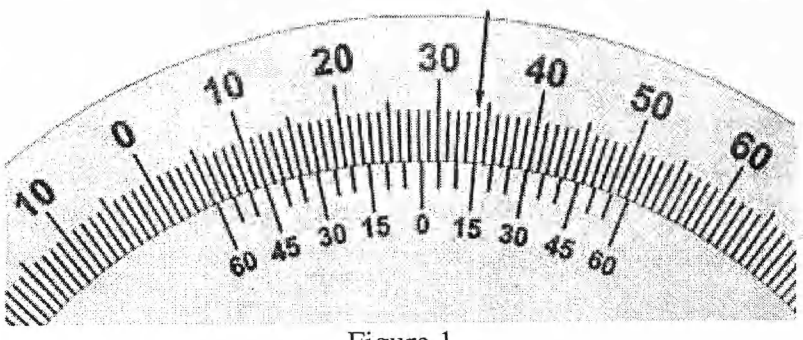

Figure 1

8. Explain working principle of Vernier instruments. Discuss how to evaluate least count of any Vernier instrument with suitable example. [3]

9. Explain Sine principle with a diagram. Describe how Sine principle can be used to setup any component into required angle very accurately. [3]

10. What are limit gauges? Explain the limit gauges used to check limits of hole and shaft. [3]

11. Explain the surface roughness parameters R_a and R_t. From the fracture mechanics approach which parameter do you think will better represent initial surface crack? [3]

12. What are the advantages of surface probe instruments over other surface roughness measurement instruments? [2]

13. Explain the measurement of gear tooth thickness by gear tooth Vernier caliper. [3]

14. Differentiate between cycloidal gear tooth and involute gear tooth. [2]

15. Describe the following methods of screw thread measurement. [2 × 1.5 = 3]
a. Bench micrometer for major diameter
b. Two wire method for effective diameter

16. Explain briefly *ANY FOUR* of the following. [4 × 1.5 = 6]

a. Lead of screw thread
b. Profile projector
c. Error in screw thread
d. Screw pitch gauge
e. Worm gears
f. Pressure angle