KATHMANDU UNIVERSITY
End Semester Examination [C]
November/December, 2023

Marks Scored:

Level : B.E.
Year : II
Course : MEEG 219
Semester : I
Exam Roll No. :
Time: 30 mins.
F. M. : 20
Registration No.:
Date : 27 NOV 2023

SECTION "A"
[20 Q. × 1 = 20 marks]

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

1. Which of the following is an advantage of Go-No Go gauge?
   [ ] Have scales and are graduated [ ] Less skilled person are required
   [ ] Does not wear [ ] Determines actual value and dimensions

2. The least count of a metric vernier caliper having 25 divisions on vernier scale, matching with 24 divisions of main scale is _____
   [ ] 0.01 mm [ ] 0.02 mm [ ] 0.001 mm [ ] 0.05 mm

3. What is the use of ratchet stop in micrometer?
   [ ] Prevent motion of spindle [ ] Maintain uniform measuring pressure
   [ ] Change the reading of thimble [ ] Reduce zero errors

4. The difference between the maximum and minimum limit of size is known as _____
   [ ] Deviation [ ] Tolerance [ ] Fit [ ] Interference

5. Ring gauge is used to measure _____
   [ ] Outside diameter but not roundness [ ] Roundness but not outside diameter
   [ ] Both outside diameter and roundness [ ] Only external threads

6. Which of the following instrument is a comparator?
   [ ] Tool makers microscope [ ] GO/NOGO gauge
   [ ] Optical Interferometer [ ] Dial Gauge

7. In a shaft basis system, the lower limit of the size of shaft is _____
   [ ] nominal size [ ] nominal size + tolerance of shaft
   [ ] nominal size - tolerance of shaft [ ] 0

8. Which type of fit is represented by hole and shaft pair designated by S8/h7?
   [ ] Clearance fit [ ] Interference fit [ ] Running fit [ ] Transition fit

9. Which of the following is the closest conversion of 0.5780 radians to degrees?
   [ ] 35 seconds [ ] 33 minutes 18 seconds
   [ ] 33.1 degrees [ ] 33 degrees 7 minutes

10. The angle subtended by each tooth of a gear is equal to _____
    [ ] Pi / Number of teeth [ ] Pressure Angle / Number of teeth
    [ ] Pi / Pressure Angle [ ] Pressure Angle / (2 X Number of teeth)

11. Which method is used to measure the minor diameter of internal thread?
[ ] Rollers and Slip Gauges [ ] Two V pieces Method
[ ] Thread Micrometer [ ] Bench Micrometer with Fiducial Indicator

12. To check the perfect threading in hole following gauge is used _____
[ ] Screw Pitch Gauge [ ] Screw Plug Gauge
[ ] Radius Gauge [ ] Centre Gauge

13. Radius gauge is used to check _____
[ ] internal and external radius [ ] only internal radius
[ ] only external radius [ ] irregular curves

14. Clearance between the mating parts is measured using _____
[ ] dial gauge [ ] go gauge [ ] no-go gauge [ ] feeler gauge

15. 20H7/g6 is a _____
[ ] interference fit [ ] transition fit [ ] clearance fit [ ] nonstandard fit

16. Wear allowance is provided on _____
[ ] Go Gauge [ ] No-go Gauge
[ ] Both Go and No-Go Gauge [ ] When both are combined in one gauge

17. If the least count of vernier caliper is 0.02 mm. Main scale reading is 20 mm and 9th division of vernier scale matches with main scale. What is the dimension?
[ ] 20.18 mm [ ] 20.90 mm [ ] 20.09 mm [ ] 20.92 mm

18. Which of the following statements is **TRUE**?
[ ] Parkinson's gear tester is used to measure variation in centre distance
[ ] Tool maker's microscope is used to measure tooth thickness
[ ] Teeth having wider flanks have less strength
[ ] All the above statements are true

19. Which of the following option is **INCORRECT** about interchangeability?
[ ] Increase output [ ] Increase cost of production
[ ] Assembly time increases [ ] Useful in mass production

20. Which principle is related to Gauge design?
[ ] Rankine principle [ ] Position principle
[ ] Taylor's principle [ ] Carnot Principle

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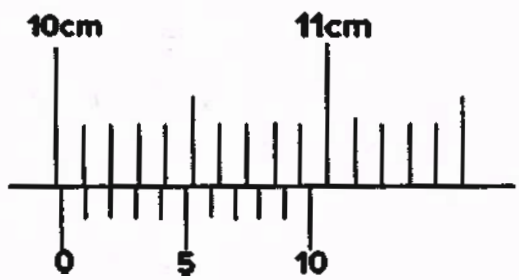
Semester : I
F. M. : 55

SECTION "B"

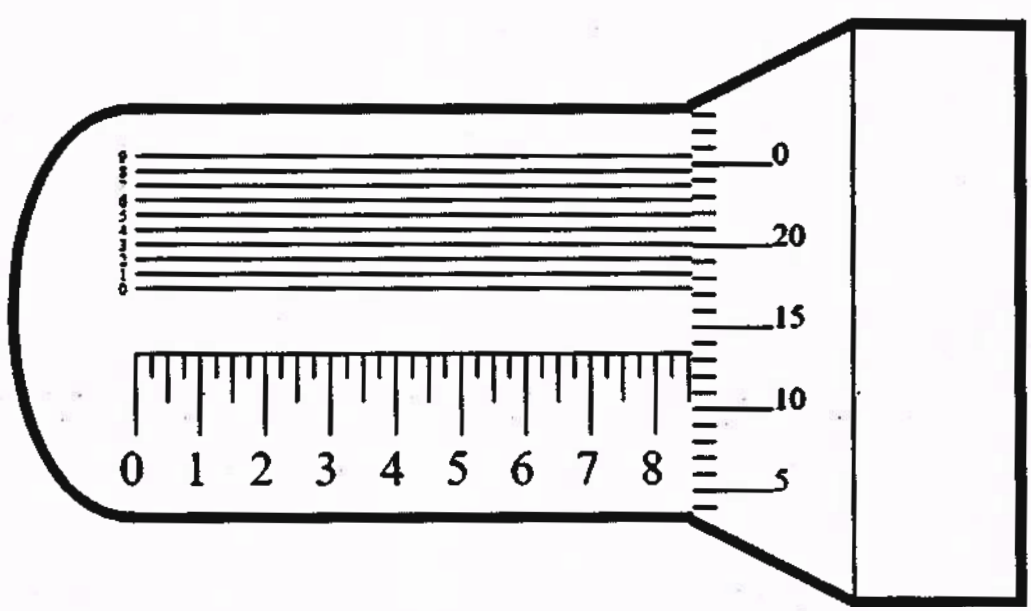
Attempt *ALL* the questions.

1. Tabulate the differences between Line Standard and End Standard with example. [3]

2. Calculate least count and reading of the given vernier caliper. Show your working. [3]



3. Calculate least count and reading of the given micrometer with 25 divisions on thimble scale and 10 divisions on vernier scale. Show your working. [3]



4. List the symbols of all six type of lay direction and explain their interpretation with figures of actual lay direction in the components. [5]

5. What is a stylus probe instrument? List any three stylus probe instrument and draw a well labeled sketch of any one instrument. [1+3]

6. Mention which angle gauges will be used to make an angle of 39°51'36" and show their arrangement. The angle so obtained is checked with a sine bar of length 250 mm. What slip gauges combination will be required to form the angle? [5]

Standard angle gauges

$[1°3'9°27'41'']$, $[1'3'9'27']$, $[3'6'18'30']$

(3) Set M112		
Range (mm)	**Steps (mm)**	**No. of blocks**
1.001 – 1.009	0.001	9
1.01 – 1.49	0.01	49
0.5 – 24.5	0.5	49
25 – 100	25	4
1.0005	—	1

7. Calculate the best size wire diameter and the difference between size under the wire and effective diameter for a M16 × 4 external screw thread. [3]

$$Correction\ Factor = \frac{P}{2}\cot\frac{\theta}{2} - d\left[\text{cosec}\frac{\theta}{2} - 1\right]$$

8. With a neat and labelled figure explain the working of Parkinson Gear Tester. [4]

9. With the help of neat figures explain clearance fit, interference fit and transition fit clearly labelling the minimum and maximum clearances/interferences. [3]

10. A clearance fit has to be provided for a shaft and bearing assembly having a diameter of 40 mm. Tolerances on hole and shaft are 0.006 and 0.004 mm, respectively. The tolerances are disposed unilaterally. If an allowance of 0.002 mm is provided, find the limits of size for **(a) hole basis system** and **(b) shaft basis system** [2+2]

11. Explain the following terms in one sentence:
    a. Null Measurement [1]
    b. Systematic Errors [1]
    c. Worm and Worm Gear [1]
    d. Backlash Errors in Gear [1]
    e. Angle of thread of Screw [1]
    f. Measurement method of Pitch of Screw Thread [1]
    g. IT Grade [1]
    h. Snap gauge [1]

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12. Design the general type of GO and NO GO gauges for components having 30 E7/g8 fit with gauge tolerance 10% of work tolerance and wear allowance 10% of gauge tolerance. Also state the type of fit of the pair.

a. $i = 0.453\sqrt[3]{D} + 0.001D$

b. 30 mm falls in the diameter step of 18–30 mm [9+1]

Grade	IT5	IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14	IT15	IT16
Tolerance in μm (For all size) $10^{0.2(N-1)}.i$	7i	10i	16i	25i	40i	64i	100i	160i	250i	400i	640i	1000i

Upper Deviation, (es)		Lower Deviation (ei)	
Shaft Designation	In microns (for D in mm)	Shaft Designation	In microns (for D in mm)
a	$= -(265 + 1.3D)$ for $D \le 120$ and $= -3.5D$ for $D > 120$	j	No formula
b	$= -(140 + 0.85D)$ for $D \le 160$ $= -1.8D$ for $D > 160$	js	IT/2
c	$= -52D^{0.2}$ for $D \le 40$ $= -(95 + 0.8D)$ for $D > 40$	k4 to k7	$= +0.6\sqrt[3]{D}$
cd	G.M. of values for c and d	k for grade ≤ 3 and ≥ 7	
d	$= -16D^{0.44}$	m	$= +(IT7 - IT6)$
e	$= -11D^{0.41}$	n	$= +5D^{0.34}$
ef	G.M. of values for e and f	p	$= +IT7 + 0$ to 5
f	$= -5.5D^{0.41}$	r	= geometric mean of values for p and s
fg	G.M. of values for f and g	s	$= IT8 + 1$ to 4 for $D \le 50$ $= +IT7$ to $+0.4D$ for $D > 50$
g	$= -2.5D^{0.34}$	t	$= +IT7 + 0.63D$
h	$= 0$	u	$= +IT7 + D$
		v	$= +IT7 + 1.25D$
		z	$= +IT7 + 1.6D$