KATHMANDU UNIVERSITY
End Semester Examination
June/July, 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 :

SECTION "A"
[20 Q. × 1 = 20 marks]

Mark [X] to the most appropriate option.

1. Which of the following statements with reference to a micrometer is **FALSE**?
   [ ] It is not as precise as a vernier caliper
   [ ] It can be used for end measurement only
   [ ] It has no parallax error
   [ ] It has a shorter measuring range compared to a vernier caliper

2. The preferred instrument for measuring holes, grooves, and recesses is
   [ ] plain scale [ ] slip gauge [ ] vernier caliper [ ] depth gauge

3. Comparison of the characteristics of line and end standards clearly shows that the accuracy
   [ ] in line standard is greater than in end standard
   [ ] in end standard is greater than in line standard
   [ ] of both are equal
   [ ] cannot be determined by the comparison of characteristics only

4. Alignment with the axis of measurement is easy in end standards because they possess?
   [ ] parallax effect [ ] airy points [ ] high accuracy [ ] a built-in datum

5. 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

6. Which thread has a combined strength of square thread and V thread?
   [ ] Acme [ ] Knuckle
   [ ] Buttress [ ] British standard Whitworth

7. Spiral gears are used to transmit power when the shafts are
   [ ] parallel [ ] interesting
   [ ] parallel and intersecting [ ] neither parallel nor intersecting

8. 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

9. The angle formed between a flank of the thread and the perpendicular to the axis of the thread, which passes through the vertex of the fundamental triangle, is called
[ ] a helix angle [ ] an included angle
[ ] a flank angle [ ] a lead angle

10. 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

11. A vernier having a least count of 0.01 mm has a zero error of +0.03 mm while measuring shows a reading of 24.08 mm. The actual value measurement will be
[ ] 24.08 mm [ ] 24.11 mm [ ] 24.05 mm [ ] 24.24 mm

12. Sine bar can be used for measuring taper
[ ] with the help of height gauge [ ] with the help of V-caliper
[ ] with the help of bevel protractor [ ] without any accessory

13. The thread micrometer measures
[ ] the major diameter of the thread [ ] the minor diameter of the thread
[ ] the effective diameter of the thread [ ] the root diameter of the thread

14. According to Taylor's principle, GO ring gauges are designed to check?
[ ] Higher Limit of Shaft [ ] Higher Limit of Hole
[ ] Lower Limit of Shaft [ ] Lower Limit of Hole

15. The joining of two slip gauges for building up a size combination is called
[ ] fixing [ ] wringing [ ] assembling [ ] pasting

16. The actual length of a pencil was 0.102 m but A measured it to be 0.100 m. What is the relative error in A's measurement?
[ ] 0.020 [ ] 0.0196 [ ] 0.002 [ ] 0.9804

17. 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

18. 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

19. The principle of "Interchangeability" is normally employed for
[ ] mass production [ ] production of identical parts
[ ] parts within the prescribed limit of sizes [ ] All of these

20. Wear allowance is provided on
[ ] Go Gauges [ ] No Go Gauges
[ ] both Go and No Go Gauges [ ] when both are combined in one gauge

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26 JUN 2023

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

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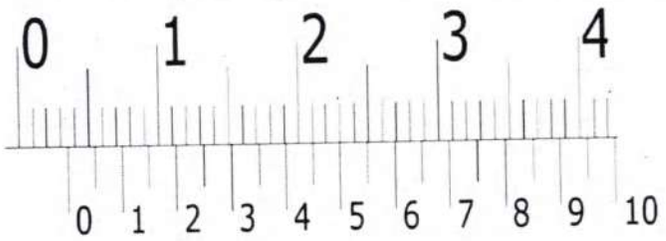
Semester : I
F. M. : 55

SECTION "B"

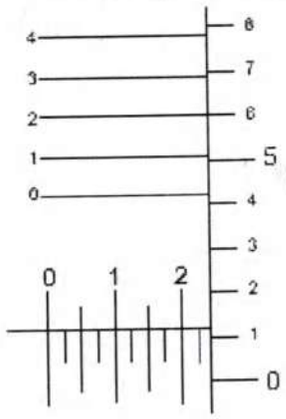
Attempt *ALL* the questions.

1. Tabulate the differences between Accuracy and Precision with an example. [3]

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

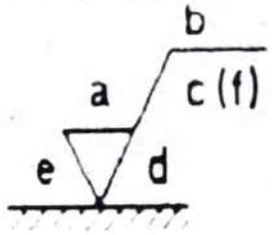


3. Calculate least count and reading of the given micrometer with 25 divisions on thimble scale and 10 divisions on vernier scale. Show your working. [3]



4. In the measurement of surface roughness, height of peaks and valley were measured in micron over a datum. Calculate the roughness values by CLA, Ten point height average, and RMS method: 3, 15, 20, 33, 25, 18, 5, 10, 15, 15, 5, 11, 14, 13, 27, 8 [5]

5. What does the following symbol represent in an engineering drawing? Also specify the terms that letters a to f represent in the symbol. [1+3]



6. Mention which angle gauges will be used to make an angle of 7°56'48" 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

$$[1^{\circ}3^{\circ}9^{\circ}27^{\circ}41^{\circ}],[13927],[3^{\circ}6'18'30'']$$

(3) Set M 112		
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 × 3.5 external screw thread. [3]

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

8. Calculate the base tangent length from the given formula and data: [4]

$$Base\ Tangent\ Length\ (d) = N.m\cos\emptyset\left[\tan\emptyset - \emptyset - \frac{\pi}{2N} + \frac{\pi S}{N}\right]$$

Diameter of gear = 100 mm; Diametral Pitch = 0.5 per mm; Number of teeth between anvil = 3; Angle subtended by each tooth = 0.0628 radians; Circular Pitch = 6.283 mm; Pressure angle =14.5°; Number of teeth = 50

9. Give dimensional examples of pairs of hole and shaft of basic size 50 mm for each of clearance fit, interference fit and transition fit in the forms: $A^{+a}_{+b}\ mm$ [3]

10. A clearance fit has to be provided for a shaft and bearing assembly having a diameter of 50 mm. Tolerances on hole and shaft are 0.008 and 0.006 mm, respectively. The tolerances are disposed unilaterally. If an allowance of 0.003 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. Parallax Error [1]
    b. Reproducibility of Measurement [1]
    c. Constant Chord of Gear [1]
    d. Run out Errors in Gear [1]
    e. Lead of Screw [1]
    f. Measurement method of Effective Diameter of Screw Thread [1]
    g. Fundamental Deviation in Tolerance [1]
    h. Gauge Tolerance [1]

12. Design the general type of GO and NO GO gauges for components having 30 D7/f8 fit with gauge tolerance 10% of work tolerance and wear allowance 10% of gauge tolerance. Also state the type of fit of the pair. [9+1]
    a. $i = 0.453\sqrt[3]{D} + 0.001D$

b. 30 *mm falls in the diameter step of* 18–30 *mm*

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
		js	$IT/2$
b	$= -(140 + 0.85D)$ for $D \le 160$ $= -1.8D$ for $D > 160$	*k4* to *k7*	$= +0.6\sqrt[3]{D}$
		k for grade ≤ 3 and ≥ 7	
c	$= -52D^{0.2}$ for $D \le 40$ $= -(95 + 0.8D)$ for $D > 40$	*m*	$= +(IT7 - IT6)$
		n	$= +5D^{0.34}$
		p	$= +IT7 + 0$ to 5
cd	G.M. of values for *c* and *d*	*r*	= geometric mean of values for *p* and *s*
d	$= -16D^{0.44}$		
e	$= -11D^{0.41}$	*s*	$= IT8 + 1$ to 4 for $D \le 50$ $= +IT7$ to $+0.4D$ for $D > 50$
ef	G.M. of values for *e* and *f*		
f	$= -5.5D^{0.41}$	*t*	$= +IT7 + 0.63D$
fg	G.M. of values for *f* and *g*	*u*	$= +IT7 + D$
g	$= -2.5D^{0.34}$	*v*	$= +IT7 + 1.25D$
h	$= 0$	*x*	$= +IT7 + 1.6D$