



**P.E.S. College of Engineering, Mandya - 571 401**  
 (An Autonomous Institution affiliated to VTU, Belagavi)  
**Third Semester, B.E. - Industrial and Production Engineering**  
**Semester End Examination; March - 2021**  
**Engineering Metrology**

Time: 3 hrs

Max. Marks: 100

**Course Outcomes**

The Students will be able to:

CO1: The students should able to learn and understand necessity of Metrology.

CO2: Students should be able to make use of different gauges.

CO3: Students will be able to use different type's comparators.

CO4: The students get exposure to different types of surface measurements methods and able to understand the gear &amp; screw threads terminology.

CO5: Students will be able to understand the need of Nondestructive testing.

**Note: I) PART - A is compulsory. Two marks for each question.****II) PART - B: Answer any Two sub questions (from a, b, c) for Maximum of 18 marks from each unit.**

Q. No.	Questions	Marks	BLs	COs	POs
<b>I : PART - A</b>		<b>10</b>			
I a.	Differentiate between accuracy and precision.	2	L1	CO1	
b.	Define the principle involved in sine bar.	2	L1	CO2	
c.	List the two important functional requirements of comparators.	2	L1	CO3	
d.	Define effective diameter in screw thread.	2	L1	CO4	
e.	What is the importance of acceptance test for machine tool?	2	L1	CO5	
<b>II : PART - B</b>		<b>90</b>			
<b>UNIT - I</b>		<b>18</b>			
1 a.	Describe the following with a neat sketch:				
	i) Imperial standard yard	9	L2	CO1	
	ii) International prototype of meter				
b.	A clearance fit has to be provided for a shaft and bearing assembly having a diameter of 40 mm. Tolerances on hole and shafts are 0.006 and 0.004 mm respectively. The tolerances are disposed unilaterally. If allowances are 0.002 mm is provided, find the limits of size for hole and shaft when?	9	L3	CO1	
	i) Hole basis system				
	ii) Shaft basis system				
	are used.				
c.	Explain briefly the airy points and state the condition to achieve it.	9	L2	CO1	

**UNIT - II****18**

2 a. Design the general type of GO and NOGO gauge for components having 30 H7/P8 fit given that;

i)  $i: 0.453\sqrt[3]{D} + 0.001D$

ii) Upper division of  $f$  shaft =  $-5.5D^{0.41}$

iii) 30 mm falls in the diameter step of 18 – 30 mm

iv) IT7 = 16i

v) IT8 = 25i

vi) Wear allowance = 10% of gauge tolerance

b. State and explain Taylor's principle of gauge design and describe why a GO gauge should be of full form.

c. Explain the term 'gauge maker's tolerance' and discuss why wear allowance should be provided to gauges?

9 L3 CO2

9 L2 CO2

9 L2 CO2

**UNIT - III****18**

3 a. With the help of neat sketch, explain the working principle of electrical comparator.

b. With the help of a figure, explain the working principle of a solex pneumatic gauge.

c. Explain the measurement methodology involved in the use of optical flats.

9 L2 CO3

9

9 L2 CO3

**UNIT - IV****18**

4 a. Derive the expression for the best-size wire in a two wire method.

b. Define the following terms with respect to surface metrology with a simple sketch:

i) Lay

ii) Traversing length

iii) Mean line of the profile

iv) Center line of the profile

c. With a neat sketch, explain the working principle of Tomlinson surface meter.

9 L2 CO4

9 L2 CO4

9 L2 CO4

**UNIT - V****18**

5 a. With the aid of sketches, describe how the following tests may be carried out on a center lathe?

i) Straightness of a bed

ii) Parallelism of the spindle axis with the guide ways

b. Explain magnetic particle inspection used to detect flaws.

c. Explain the ultrasonic inspection with neat sketch.

9 L2 CO5

9 L2 CO5

9 L2 CO5