



# P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B. E. - Mechanical Engineering

Semester End Examination; July / August - 2022

**Mechanical Measurements and Metrology**

Time: 3 hrs

Max. Marks: 100

## Course Outcome

The Students will be able to:

CO1: **Explain** measurement, metrology, various standards of measurements and elements of measurement systems.

CO2: **Calculate** tolerances and **design** plug and ring gauges.

CO3: **Explain** different types of comparators, angle measuring devices and **derive** expressions for finding effective diameter of screw threads.

CO4: **Explain** sensor transducers, signal conditioning and terminating devices with associated parameters.

CO5: **Explain** basic principles and devices involved in measuring strain, force, torque, pressure and temperature

**Note:** i) **PART-A** is compulsory. One question from each unit for maximum of 2 marks.

ii) **PART-B** Answer any **TWO** sub questions (from a, b, c) from each unit for a Maximum of 18 marks.

Q. No.	Questions	Marks	BLs	COs
<b>I:PART - A</b>		<b>10</b>		
I a.	Define Line standard.	2	L1	CO1
b.	Discuss the term interchangeability.	2	L1	CO2
c.	Name the methods of measuring surface finish.	2	L1	CO3
d.	What is a transducer?	2	L1	CO4
e.	Give the two laws of thermocouple.	2	L1	CO5
<b>PART - B</b>		<b>90</b>		
<b>UNIT - I</b>		<b>18</b>		
1 a.	Define Metrology and explain its significance in engineering.	9	L2	CO1
b.	Build 56.675 mm using M112 set of gauges.	9	L2	CO1
c.	With a neat sketch, explain wringing phenomenon with respect to slip gauges.	9	L2	CO1
<b>UNIT - II</b>		<b>18</b>		
2 a.	Determine the type of fit after deciding the fundamental derivations and tolerances in the following Fit $\phi 70H_9e_7$ Diameter step (50-80) Fundamental derivations for e shaft = $-11D^{0.41}$ , $It_7 = 16i$ , $IT_9 = 40i$ , $i = 0.45\sqrt[3]{D} + 0.001D$	9	L3	CO2
b.	Explain Taylor's principle for the design of limit gauges.	9	L2	CO2
c.	Explain the following terms:			
	i) Clearance fit	9	L2	CO2
	ii) Interference fit			
	iii) Transition fit			

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

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|------|--|---|----|-----|
| 3 a. | With a neat sketch, describe construction and working of LVDT.           | 9 | L2 | CO3 |
| b.   | with a neat sketch, explain principle and working of Johnson Mikroikator | 9 | L3 | CO3 |
| c.   | Explain with a neat sketch Taylor-Hobson talysurf.                       | 9 | L2 | CO3 |

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

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|------|--|---|----|-----|
| 4 a. | What is transducer? List the advantages of electrical transducers over mechanical transducers. | 9 | L2 | CO4 |
| b.   | With a neat sketch, explain simple current sensitive circuit.                                  | 9 | L2 | CO4 |
| c.   | With a neat sketch, explain telemetry transmitting and receiving system.                       | 9 | L2 | CO4 |

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

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|------|---|---|----|-----|
| 5 a. | Write a note on Wheatstone bridge circuit with a circuit diagram. | 9 | L2 | CO5 |
| b.   | Describe the Bridgeman gauge with neat sketch.                    | 9 | L2 | CO5 |
| c.   | With a neat sketch, explain Pirani thermal conductivity gauges.   | 9 | L2 | CO5 |

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