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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; Sep. / Oct. - 2023

Mechanical Measurements and Metrology

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply fundamentals of metrology and measurement.

CO2: Design tolerances and fits for selected product quality.

CO3: Analyze appropriate method and instruments for inspection of various mechanical systems.

CO4: Make use of experimental data for writing a report as an individual or as a team member to communicate effectively.

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

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

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	Differentiate between line standard and end standard.	2	L2	CO1	PO1
b.	Write a short note on wear allowance on gauges.	2	L2	CO2	PO1
c.	State the principle of back pressure in pneumatic comparator.	2	L2	CO1	PO2
d.	State and explain transfer efficiency.	2	L2	CO2	PO3
e.	Define vacuum pressure and absolute pressure.	2	L2	CO2	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Explain the various stages of generalized measurement systems for dial gauge.	9	L2	CO1	PO1
b.	Three 100 mm gauges are measured on a level comparator by first wringing them together and then comparing with 300 mm gauge and an inter-comparing them. The 300 mm gauge actually measures 300.0025 mm, and the three gauges together have a combination length of 300.0035 mm gauge *A* is 0.0020 mm longer than gauge *B* but shorter than gauge *C* by 0.0010 mm. Determine the corrected length of each gauge.	9	L3	CO1	PO1
c.	Discuss NPL method of deriving end standard from line standard.	9	L2	CO1	PO1
	UNIT - II	**18**			
3 a.	With necessary sketch, explain the three types of fits and their practical applications.	9	L3	CO2	PO2

Contd….2

b.	Determine the types of fit after deciding the fundamental deviations and tolerances in the following: Fit ϕ $70H_9e_7$ diameter step(50 - 80) Fundamental deviations for 'e' shaft = $-11D^{0.41}$ $IT_7 = 16i$, $IT_9 = 40i$, $i = 0.45\sqrt[3]{D} + 0.001D$ in μm	9	L3	CO2	PO2
c.	With necessary sketch, discuss the use of single ended, double ended and shell form of plug gauges.	9	L2	CO3	PO2
	UNIT - III	**18**			
4 a.	Draw the neat sketch of the following and explain their working: i) Dial gauge ii) LVDT	9	L2	CO3	PO2
b.	Discuss the surface roughness terminologies with schematic diagram.	9	L2	CO3	PO2
c.	Draw the sigma comparator and explain its working. Also discuss the magnification scale in detail.	9	L2	CO3	PO2
	UNIT - IV	**18**			
5 a.	Discuss at least three-pressure sensitive elements with necessary sketch.	9	L2	CO3	PO2
b.	Draw the neat sketch of sliding contact resistive type and capacitive transducers and explain their working.	9	L2	CO3	PO2
c.	Describe the applications of telemetry in wireless transmission of signal with block diagram.	9	L2	CO3	PO2
	UNIT - V	**18**			
6 a.	Write a short note on thermocouple materials. State and explain laws of thermocouple.	9	L2	CO1	PO1
b.	Brief on the various methods of strain measurement and strain gauge.	9	L2	CO3	PO2
c.	Describe the steps involved in vacuum pressure measurement using pirani thermal conductivity gauge.	9	L2	CO3	PO2

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