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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

Branch: Industrial Engineering and Management **Duration: 3 hrs.**

Course Code: 23IM3PCIME **Max Marks: 100**

Course: Industrial Metrology

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		Define: i. metrology ii. Standard. Also state the objectives of Metrology.	CO1	PO1	**10**
	b)		Explain with sketch: i. Imperial standard Yard ii. International Prototype Meter.	CO1	PO1	**10**
			OR			
2	a)		Define 'fit'. With the help of neat sketches, compare the different types of fits that are available for assembly design.	CO3	PO3	**10**
	b)		Determine the tolerances on the hole and the shaft for a precision running fit designated by 50 H7g6, given; 50 mm lies between 30-50 mm. i (in microns)= $0.45(D)^{1/3}$ +0.001D Fundamental deviation for 'H' hole=0 Fundamental deviation for g shaft = $-2.5D^{0.34}$ IT7=16i and IT6=10i State the actual maximum and minimum sizes of the hole and shaft and maximum and minimum clearances.	CO3	PO3	**10**
			UNIT - II			
3	a)		Draw a neat sketch of a screw thread and indicate the important thread parameter. Also, define the following terms with respect to a screw thread: i) Major DIA ii) Depth of thread iii) Pitch iv) Helix angle.	CO1	PO1	**10**
	b)		With the set up, explain how the effective diameter of screw thread is measured using the two wire method.	CO1	PO1	**10**
			OR			
4	a)		Describe the chordal thickness method using gear tooth vernier caliper.	CO1	PO1	**10**
	b)		What are sine bars? With the help of a sketch explain the working principle of sine bars.	CO1	PO1	**10**

			UNIT - III			
	5	a)	What is a comparator in measurement systems? Provide some industrial applications of comparators. Also, compare and contrast mechanical and electrical comparators.	*CO2*	*PO2*	**10**
		b)	Describe the construction and working principle of a Sigma Comparator with the help of neat sketch.	*CO2*	*PO2*	**10**
			OR			
	6	a)	Define The RMS value of surface roughness. Give an overview of Inspection by comparison methods of measuring surface finish.	*CO1*	*PO1*	**10**
		b)	Explain the general construction and working principle of a stylus probe-type instrument used for measuring surface roughness. Also, list the advantages and limitations of this kind of instrument.	*CO1*	*PO1*	**10**
			UNIT - IV			
	7	a)	Define the following with respect to an instrument: i) Sensitivity ii) Threshold iii) Hysteresis iv) Reproducibility and v) Calibration	*CO1*	*PO1*	**10**
		b)	Explain the concepts of systematic and random errors in measurement and elaborate on their differences	*CO1*	*PO1*	**10**
			OR			
	8	a)	What is a transducer? Differentiate between primary and secondary transducers with example. Also list its important uses.	*CO2*	*PO2*	**10**
		b)	What are pressure measuring devices? With a neat sketch, explain the Bridgeman gauge, used for pressure measurement.	*CO2*	*PO2*	**10**
			UNIT - V			
	9	a)	What is laser metrology? What are the different techniques used in laser metrology? What are the advantages of using laser metrology over conventional measurement methods?	*CO1*	*PO1*	**10**
		b)	Explain the basic components of a Coordinate Measuring Machine (CMM). Discuss the challenges in using CMMs in industrial settings.	*CO1*	*PO1*	**10**
			OR			
	10	a)	How does the concept of coherence in lasers contribute to their effectiveness in metrology? Additionally, explain what laser interferometry is and how it is used to measure distances with extreme precision in metrology	*CO1*	*PO1*	**10**
		b)	Explain concept of Nano Metrology. Also discuss its importance in modern metrology, highlighting its role and techniques employed in ensuring measurement accuracy at the nanoscale.	*CO1*	*PO1*	**10**

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