U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester : V**

Branch: Mechanical Engineering **Duration: 3 hrs.**

Course Code: 23ME5PCMMM / 22ME5PCMMM **Max Marks: 100**

Course: Mechanical Measurements and 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)	With neat sketches, explain (i) International prototype meter and (ii) Imperial standard yard.	CO1	PO1	**10**
	b)	Differentiate between line standards and end standards with examples for each.	CO1	PO1	**06**
	c)	Build up a length of 35.4875 mm using M112 set. Use two protector slips of 2.5 mm each.	CO1	PO1 PO2	**04**
		OR			
2	a)	Explain (i) Interchangeability and selective assembly (ii) Unilateral and bilateral tolerances (iii) Hole basis and shaft basis system	CO1	PO1	**12**
	b)	Calculate all the relevant dimensions of $35H_7/f_8$ fit, dimension 35 mm falls in the step of 30-50 mm. The fundamental deviation for f shaft is $-5.5D^{0.41}$. i (in microns) $=0.45(D)^{1/3}+0.001D$, IT7=16i and IT8=25i.	CO1	PO1 PO2	**08**
		UNIT - II			
3	a)	With relevant sketches, explain Taylor's principle of design of limit gauges.	CO2	PO1	**08**
	b)	Calculate the dimensions of plug & ring gauges to control the production of 50 mm shaft & hole pair of H_7d_8 as per IS specifications. The following assumptions may be made: 50 mm lies in diameter step of 30-50 mm. Upper deviation for 'd' shaft is $-16D^{0.44}$ and lower deviation for hole H is zero. Tolerance unit in 'i' in microns is $=0.45\sqrt[3]{D}+0.001D$ and IT6=10i and above IT6 grade, the tolerance is multiplied by 10 at each 5th step.	CO2	PO1 PO2	**12**
		OR			
4	a)	What is a comparator? List the types of mechanical comparators.	CO2	PO1	**04**
	b)	Sketch and explain LVDT. Mention the advantages of LVDT.	CO2	PO1	**08**
	c)	Explain the principle of angle measurement using a bevel protractor.	CO2	PO1	**08**

			UNIT - III			
	5	a)	With a block diagram, explain the elements of a generalized measurement system.	*CO3*	*PO1*	**08**
		b)	Define (i) Accuracy (ii) Precision (iii) Resolution (iv) Threshold (v) Calibration (vi) Linearity	*CO3*	*PO1*	**06**
		c)	Explain the working of electrokinetic transducer with a neat sketch.	*CO3*	*PO1*	**06**
			OR			
	6	a)	What are the problems associated with mechanical type of signal conditioning devices? Explain any two in brief.	*CO3*	*PO1*	**10**
		b)	Explain the use of ballast circuit with the help of a schematic diagram.	*CO3*	*PO1*	**10**
			UNIT - IV			
	7	a)	Sketch & explain the working of a cantilever beam used for measurement of force.	*CO4*	*PO1*	**08**
		b)	With a neat sketch, illustrate the measurement of torque using a Prony brake dynamometer.	*CO4*	*PO1*	**08**
		c)	Write a short note on temperature compensation in strain gauges.	*CO4*	*PO1*	**04**
			OR			
	8	a)	What is an RTD? Discuss briefly the three configurations of RTD with sketches. Also mention the disadvantages of RTD.	*CO4*	*PO1*	**10**
		b)	Discuss the principle of working of an optical pyrometer with a schematic diagram. Also mention its applications.	*CO4*	*PO1*	**10**
			UNIT - V			
	9	a)	What are CMM's? Discuss the modes of operation of CMMS's. Also list the major applications of CMM.	*CO4*	*PO1*	**10**
		b)	With a schematic diagram, explain Universal measuring machine.	*CO4*	*PO1*	**10**
			OR			
	10	a)	Give the classification of nanostructures and discuss their applications.	*CO4*	*PO1*	**10**
		b)	Sketch and explain a laser deflection type instrument used as an atomic force microscope.	*CO4*	*PO1*	**10**

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