Reg. No.																

Question Paper Code	14290

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Fourth Semester

Mechanical Engineering

20MEPC402 - METROLOGY, MEASUREMENTS AND COMPUTER AIDED INSPECTION

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Error of Measurement is (a) measured value – true value (b) true value – measured value (c) measured value – precision (d) precision – true value	1	K1	CO1
2.	Systematic errors are (a) controllable errors (b) random errors (c) uncontrollable errors (d) none of the mentioned	1	K1	CO1
3.	Angle Dekkor is another type of (a) auto-collimator (b) optical square (c) clinometer (d) angle gauge	1	K1	CO2
4.	Which part of the bevel protractor is used to align with the edge of a workpiece? (a) Stock (b) Blade (c) Dial (d) Vernier scale	1	K1	CO2
5.	Thermocouple works on (a) Peltier Effect (b) Kelvin Effect (c) Thomson Effect (d) Seebeck Effect	1	K1	CO3
6.	The principle of operation of LVDT is based on variation of (a) self-inductance (b) mutual inductance (c) reluctance (d) permeance	1	K1	CO3
7.	What precise movement does CMM have? (a) Precise movement in x coordinate (b) Precise movement in x and y coordinates (c) Precise movement in y and z coordinates (d) Precise movement in x, y and z coordinates	1	K1	CO4
8.	What is the cause of translational errors in CMM? (a) Error in scale division (b) Error in straightness (c) Twisting error (d) Roll error	1	K1	CO4
9.	Which among the following is used to create fringes in N.P.L. interferometer? (a) Condensing lens (b) Collimating lens (c) Optical flat (d) All of the above	1	K1	CO5
10.	Which type of illumination is ideal for high contrast applications? (a) Bright Field illumination (b) Dark field illumination (c) Light field illumination (d) Shaded field illumination	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	List down the various types of linear measuring instruments.	2	K1	CO1
12.	Differentiate between accuracy and precision.	2	K2	CO1
13.	State the limitations of sine bar.	2	K1	CO2
14.	Differentiate between contact and non-contact methods of surface roughness measurement.	2	K2	CO2
15.	Outline the primary use of a gear tooth vernier calliper.	2	K2	CO3
16.	What is an RTD?	2	K1	CO3
17.	Define the term "measurement uncertainty" in CMM operations.	2	K1	CO4
18.	Outline the role of software in a Coordinate Measuring Machine (CMM).	2	K2	CO4
19.	List the key components of a Zeiss Interferometer system.	2	K1	CO5
20.	Summarize the significance of fringe patterns in interferometry measurements.	2	K2	CO5
21.	What is meant by Computer-Aided Inspection (CAI)?	2	K1	CO6

22.	Outline the role of image processing in Computer Aided Inspection.			2	K2	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain the concept of measurement using a vernier caliper with the help of neat diagram.		11	K2	CO1
		OR				
	b)	Explain the construction and working of a dial indicator which is used as a mechanical comparator.		11	K2	CO1
24.	a)	Apply the principles of angular measurement to determine the taper angle of a shaft using a sine center.		11	K2	CO2
		OR				
	b)	Identify how to set up and utilize an autocollimator to obtain an accurate angular measurement.		11	K2	CO2
25.	a)	Explain in detail the various elements of a screw thread that are measured during inspection.		11	K2	CO3
		OR				
	b)	Explain the working principle of an LVDT with a neat diagram. Also list its advantages, disadvantages and applications.		11	K2	CO3
26.	a)	Explain the main types of CMMs and their difference in detail.		11	K2	CO4
		OR				
	b)	How does a CMM ensure precise measurement of an object's dimensions? Explain in detail.		11	K2	CO4
27.	a)	Describe the construction and working of a Michelson interferometer.		11	K3	CO5
		OR				
	b)	Explain the working principle of the NPL flatness interferometer. How does it differ from conventional interferometers?		11	K3	CO5
28.	a)	Identify the essential components required for a machine vision system. Explain them with a neat block diagram.		11	K3	CO6
		OR				
	b)	Apply the machine vision in robotic guidance and pick-and-place operations in smart factories.		11	K3	CO6