

Reg. No.																			
----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code	13001
---------------------	-------

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Fourth Semester

Mechanical Engineering

20MEPC402 - METROLOGY, MEASUREMENTS AND COMPUTER AIDED INSPECTION

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

	Marks	K- Level	CO
1. The least count of a micrometer. (a) 0.01 mm (b) 0.1 mm (c) 0.02 mm (d) 0.2 mm	1	K1	CO1
2. Which comparators is best suited for inspection of small gears and screws? (a) Autocollimator (b) Johansson mikrokator (c) Profile projector (d) Zeiss ultra-optimizer	1	K1	CO1
3. Which of the following may not be a cause of Environmental error? (a) Changes in temperature, humidity (b) Availability of dust (c) Effects of external magnetic or electrostatic fields (d) Improper use of instruments	1	K2	CO1
4. Which of the following is incorrect regarding sine bars? (a) Sine bar is itself a complete measuring instrument (b) Some holes are drilled in the body (c) It can be used to locate any work to a given angle (d) It is capable of self generation	1	K2	CO2
5. The method is used for the determination of flatness when the surface is irregular. (a) Half grid method (b) Grid method (c) Contact method (d) Non contact method	1	K1	CO2
6. The instrument is most suitable for measuring angular alignment of machine tools. (a) Clinometer (b) Sine Bar (c) Bevel Protractor (d) Spirit Level	1	K1	CO2
7. The tool used for checking the tooth thickness of gears is. Gear tooth caliper (b) Dial gauge (c) Vernier scale (d) Thread gauge	1	K1	CO3
8. The methods is used for measuring gear pitch. (a) Surface gauge (b) Bevel protractor (c) Rolling gear tester (d) Interference method	1	K1	CO3
9. Torque is commonly measured in rotating shafts using a Load cell (b) Tachometer (c) Dynamometer (d) Barometer	1	K1	CO3
10. One major limitation of laser interferometry is. (a) It generates only two wavelengths (b) It does not have a constant wavelength (c) It generates only a single wavelength (d) Its wavelength cannot be predicted	1	K2	CO4
11. CMM enables the location of point coordinates in a. (a) 3D space (b) 2D space (c) Horizontal plane only (d) Vertical plane only	1	K1	CO4
12. In laser holography, what is recorded to create a 3D image? (a) Reflective light intensity (b) Light polarization (c) Interference pattern of light (d) Sound wave frequency	1	K2	CO4
13. The digitized frame of the image in a machine vision system is referred to as. (a) ADC (b) Frame buffer (c) Vision buffer (d) DAC	1	K1	CO5
14. A thermal camera captures images based on. (a) Visible light (b) Infrared radiation (c) Ultraviolet radiation (d) X-rays	1	K1	CO5
15. When inspecting transparent objects, which type of lighting is generally preferred to detect scratches and defects? (a) Front lighting (b) Backlighting (c) Dark-field lighting (d) Strobe lighting	1	K2	CO5
16. Software is widely used for image processing and analysis in machine vision. (a) MATLAB (b) AutoCAD (c) SPICE (d) SolidWorks	1	K1	CO5

17. A primary application of machine vision in industrial automation. 1 K2 CO6
 (a) Controlling production schedules (b) Visual inspection and quality control
 (c) Data entry (d) Employee time tracking
18. Machine vision systems measure dimensions by analysing. 1 K2 CO6
 (a) The weight of the object (b) Geometric properties in an image
 (c) Sound waves (d) Magnetic properties
19. Which industry most commonly uses machine vision pattern recognition for identifying and sorting products based on logos or packaging designs? 1 K2 CO6
 (a) Automotive (b) Food and beverage
 (c) Pharmaceutical (d) Telecommunications
20. The quality of straightness in precision engineering is represented by. 1 K1 CO6
 (a) Spirit level (b) Straight edge (c) Autocollimator (d) Dial indicator

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21. Differentiate between systematic and random errors. 2 K2 CO1
22. Define calibration. 2 K1 CO1
23. List primary reasons for surface irregularities. 2 K2 CO2
24. What is wringing of gauge blocks? 2 K1 CO2
25. Recall drunken error in screw threads. 2 K2 CO3
26. List the factors that influence the response of a temperature sensing device. 2 K2 CO3
27. What is the significance of the word 'coordinate' in a CMM? 2 K1 CO4
28. Why laser is preferred in engineering metrology? 2 K2 CO4
29. What is the role of diffuse lighting in machine vision? 2 K2 CO5
30. How does an angle dekkor differ from an autocollimator? 2 K2 CO6

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31. a) Discuss the different types of errors and how they can be eliminated. 10 K2 CO1
OR
 b) Explain the working principle of a Vernier caliper. Describe how it achieves precise measurements and the role of the Vernier scale. 10 K2 CO1
32. a) Describe the components and functionality of a bevel protractor with neat sketch. 10 K2 CO2
OR
 b) Describe any two method of testing flatness of a surface plate. 10 K2 CO2
33. a) Explain any two methods of temperature measurements with neat sketches. 10 K2 CO3
OR
 b) Identify the equipment used to inspect the composite gear and explain its working principle with neat sketch. 10 K2 CO3
34. a) Explain the construction and operation of a co-ordinate measuring machine. 10 K2 CO4
OR
 b) Describe the construction and working of AC Laser Interferometer. 10 K2 CO4
35. a) Discuss the key factors involved in designing a machine vision system. 10 K2 CO5
OR
 b) Explain how laser triangulation works in a laser vision system for 3D measurement. 10 K2 CO5
36. a) Explain the working principle of autocollimator with neat sketches and mention their applications. 10 K2 CO6
OR
 b) Explain how machine vision is used for dimensional measurement in automated production lines. 10 K2 CO6