

**M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025**  
 Second Semester  
**M.E. - CAD/CAM**  
**24PCDEL210 - METROLOGY AND NON DESTRUCTIVE TESTING**  
 Regulations - 2024

Duration: 3 Hours

Max. Marks: 100

**PART - A (MCQ) (10 × 1 = 10 Marks)**

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. Tool Maker's Microscope is primarily used for: (a) Measuring temperature                      (b) Inspecting small components and tool geometry (c) Counting particles                              (d) Checking electrical signals	1	K1	CO1
2. The main advantage of machine vision is: (a) Subjective inspection                              (b) Consistent and rapid inspection (c) Slow scanning                                      (d) High manual load	1	K1	CO1
3. The main objective of Statistical Quality Control (SQC) is: (a) Reduce labour cost                              (b) Maintain and improve product and process quality (c) Increase machine speed                              (d) Reduce production time	1	K1	CO2
4. Probability is defined as: (a) Average value of samples                              (b) Measure of uncertainty of an event (c) Fraction defective                                      (d) Dispersion value	1	K1	CO2
5. Liquid penetrant testing is primarily used to detect: (a) Internal defects                                      (b) Surface-breaking defects (c) Chemical composition                              (d) Hardness variation	1	K1	CO3
6. Magnetic particle testing requires the material to be: (a) Non-conductive                              (b) Ferromagnetic                              (c) Porous                              (d) Transparent	1	K1	CO3
7. X-rays are produced when: (a) Electrons collide with the nucleus                              (b) Electrons change energy levels in atoms (c) Protons accelerate                                      (d) Neutrons split	1	K1	CO4
8. An exposure chart is used to: (a) Determine material hardness                              (b) Select appropriate exposure time and intensity (c) Set welding current                                      (d) Measure density	1	K1	CO4
9. Ultrasonic waves used in NDT are typically generated by: (a) Electric sparks                                      (b) Piezoelectric transducers (c) Magnetic coils                                      (d) Chemical reactions	1	K1	CO5
10. A major application of the pulse-echo method is: (a) Measuring colour contrast                                      (b) Thickness gauging (c) Chemical composition testing                                      (d) Hardness testing	1	K1	CO5

**PART - B (12 × 2 = 24 Marks)**

Answer ALL Questions

11. What is the function of a Universal Measuring Machine (UMM)?	2	K1	CO1
12. Differentiate between contact and non-contact measurement methods with one example each.	2	K2	CO1
13. Elaborate how measures of central tendency differ from measures of dispersion.	2	K2	CO2
14. How do reliability improvement methods enhance product performance?	2	K1	CO2
15. What are the essential characteristics of a good liquid penetrant used in NDT?	2	K1	CO3
16. What limitations restrict the use of magnetic particle testing in industry?	2	K1	CO3
17. What are the major properties of diagnostic (d-rays) and X-rays used in industrial radiography?	2	K1	CO4

18. What is the purpose of filtration in X-ray equipment, and how does it modify beam quality? 2 K1 CO4
19. How are ultrasonic waves produced in NDT using piezoelectric transducers? 2 K1 CO5
20. What general characteristics of ultrasonic waves make them suitable for defect detection? 2 K1 CO5
21. Why is the X-ray method preferred for detecting internal discontinuities compared to visual or surface inspection? 2 K1 CO4
22. What are the major advantages and limitations of acoustic emission techniques in industrial inspection? 2 K1 CO5

**PART - C (6 × 11 = 66 Marks)**

Answer ALL Questions

23. a) Interpret the importance of machine vision methods on measurement. 11 K2 CO1
- OR**
- b) Explain the working principle of a Tool Maker's Microscope and its significance in precision measurement tasks. 11 K2 CO1
24. a) Explain in detail on control charts for variables. 11 K2 CO2
- OR**
- b) Describe the ABC standard for quality classification and apply it to categorize inventory items in a production setting. 11 K2 CO2
25. a) Identify the method used to inspect Pipe and piston head Component and explain the steps involved during inspection. 11 K2 CO3
- OR**
- b) Describe the methods of producing magnetic fields for magnetic particle inspection. 11 K2 CO3
26. a) Explain the different sources of radiation used in radiographic testing, with emphasis on X-ray and gamma-ray production. 11 K2 CO4
- OR**
- b) Discuss the factors affecting radiographic contrast and how contrast impacts defect visibility in radiographs. 11 K2 CO4
27. a) Explain the principle of ultrasonic testing with suitable block diagram. Mention the advantage and disadvantage of ultrasonic testing. 11 K2 CO5
- OR**
- b) Differentiate between A-scan, B-scan, and C-scan presentations in ultrasonic testing. 11 K2 CO5
28. a) Explain the key characteristics of radiographic films used in industrial radiography. 11 K2 CO4
- OR**
- b) Describe the working principle with neat sketch of following 11 K2 CO5
- (i) Piezo-Electric transducer.
- (ii) Electro Magnetic Acoustic Transducer (EMAT).