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Question Paper Code	14116
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Seventh Semester

Mechanical Engineering

20PROE907 - TESTING OF MATERIALS

Regulations - 2020

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. If a material has identical properties at all locations it is said to be (a) elastic (b) Homogeneous (c) isotropic (d) None of these	1	K2	CO1
2. The maximum stresses at which the billion reversal of stress cannot cause failure of material is called (a) endurance limit (b) lower limit (c) factor of safety (d) upper limit	1	K2	CO1
3. The VHN for a material 20kg load and an average indentation diagonal of 0.3mm is (a)78 (b) 324 (c) 115 (d) 412	1	K1	CO2
4. In Charpy test the specimen is typically (a) Cylindrical rod without defect (b) Rectangular bar with notch in middle (c) Sheet of material placed under compression (d) subject to tensile load	1	K1	CO2
5. Explain the Electrical properties of engineering materials (a) Magnetic Particle (b) Liquid Penetrant (c) Visual Inspection (d) Radiography test	1	K1	CO3
6. Which NDT method is best for detecting very fine internal cracks in welds? (a) Visual Inspection (b) Ultrasonic Testing (c) Liquid Penetrant Testing (d) Thermography	1	K1	CO3
7. A limitation of Eddy Current Testing is (a) Only works on non-conductive materials (b) Cannot detect surface cracks (c) Limited to conductive materials and shallow penetration (d) Requires radioactive sources	1	K2	CO4
8. In Scanning Electron Microscopy (SEM), the image is formed by (a) Transmitted electrons through the specimen (b) Backscattered and secondary electrons from the surface (c) Reflected light from the surface (d) Magnetic field variations	1	K1	CO4
9. Inductively Coupled Plasma – Optical Emission Spectroscopy (ICP-OES) is based on: (a) Absorption of X-rays (b) Emission of light from excited atoms in plasma (c) Measuring mass-to-charge ratio of ions (d) Detecting surface cracks	1	K1	CO5
10. One of the main applications of Differential Thermal Analysis (DTA) is (a) Measuring mechanical properties under stress (b) Detecting phase transformations and melting points (c) Determining electrical conductivity (d) Detecting surface cracks	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. Classify Materials and Metals.	2	K2	CO1
12. Give the difference between Material Science and Engineering.	2	K2	CO1

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

14116

13. What is 0.2% proof stress?	2	K2	CO2
14. What are structure-sensitive and structure insensitive properties?	2	K1	CO2
15. What are the advantages of Non-Destructive Testing over Destructive Testing?	2	K2	CO3
16. List the types of defects analysis in LPT method.	2	K1	CO3
17. List the component of eddy current testing.	2	K1	CO4
18. List the various magnetic techniques used for material testing.	2	K1	CO4
19. Summarize the types of thermal testing.	2	K2	CO5
20. Summarize the advantages of X-ray fluorescence.	2	K2	CO5
21. What is fluorescence analysis?	2	K1	CO5
22. Summarize the applications of OE spectroscopy.	2	K2	CO3

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) Explain the Thermal properties of engineering materials.	11	K2	CO1
OR			
b) Discuss different testing organizations and their committees.	11	K2	CO1
24. a) Explain in detail the engineering stress strain curve of mild steel.	11	K2	CO2
OR			
b) Summarize the concepts of ductility, modulus of elasticity, toughness, and resilience to evaluate the suitability of a material for designing a structural component.	11	K2	CO2
25. a) Analyse the various Non-Destructive Testing (NDT) methods used for detecting manufacturing defects and material characterization, highlighting how each technique differentiates surface and subsurface flaws.	11	K4	CO3
OR			
b) Analyze the working principle of Ultrasonic Testing (UT) with a suitable sketch, explaining how variations in wave reflections help in identifying different types of internal defects.	11	K4	CO3
26. a) List and explain the application of Gas analysis by mass spectrometry.	11	K2	CO4
OR			
b) Explain Atomic Absorption Spectrometry with sketches.	11	K2	CO4
27. a) Describe chemical analysis for the parameter measurement.	11	K2	CO5
OR			
b) Explain the Electrical properties of engineering materials.	11	K2	CO1
28. a) Analyze the importance of exposure charts in Radiographic Testing with a neat sketch, and explain how variations in exposure parameters affect image quality and defect detection.	11	K4	CO3
OR			
b) Analyze the effectiveness of Magnetic Particle Testing (MPT) in detecting surface and subsurface cracks in a steam turbine blade, and compare its performance with Liquid Penetrant Testing (LPT) for the same inspection conditions.	11	K4	CO3