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Question Paper Code : 81925

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Seventh/Nineth Semester

Mechanical Engineering

OML 351 — INTRODUCTION TO NON-DESTRUCTIVE TESTING

(Common to Aeronautical Engineering/Aerospace Engineering/Automobile Engineering/Biomedical Engineering/Civil Engineering/Computer Science and Design/Computer Science and Engineering/Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Cyber Security)/Computer and Communication Engineering/Electrical and Electronics Engineering/Electronics and Communication Engineering/Electronics and Instrumentation Engineering/Electronics and Telecommunication Engineering/Environmental Engineering/Geoinformatics Engineering/Industrial Engineering/Industrial Engineering and Management/Instrumentation and Control Engineering/ Manufacturing Engineering/Marine Engineering/Mechanical Engineering (Sandwich)/Mechanical and Automation Engineering/Mechatronics Engineering/Medical Electronics/ Petrochemical Engineering/Production Engineering/Robotics and Automation/Safety and Fire Engineering/Agricultural Engineering/Artificial Intelligence and Data Science/Bio Technology/ Biotechnology and Biochemical Engineering/Chemical Engineering/Computer Science and Business systems/Fashion Technology/Food Technology/Handloom and Textile Technology/Information Technology/Petrochemical Technology/Petroleum Engineering/Pharmaceutical Technology/Textile Chemistry/Textile Technology)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the primary uses of a borescope in industrial inspections?
2. Define visual perception in the context of NDT.
3. Define demagnetization in Magnetic Particle Testing (MPT).

4. What is the function of cleaners in Liquid Penetrant Testing?
5. Define active thermography.
6. Name two eddy current sensing elements.
7. What is the function of attenuation in ultrasonic testing?
8. Define Kaiser effect in Acoustic Emission Technique.
9. Write the significance of penetrometer.
10. What is shadow formation in radiography?

PART B — (5 × 13 = 65 marks)

11. (a) Explain how mirrors and magnifiers are used in indirect visual testing to inspect areas that are difficult to access directly, highlighting their role in enhancing visibility and magnification for detailed examination.

Or

- (b) Explain the design, functionality, and applications of borescopes and fibroscopes, highlighting their role in visual inspection, diagnostics, and maintenance in industries such as aerospace, automotive, and manufacturing.

12. (a) Explain the working principle, procedure, advantages, and limitations of Liquid Penetrant Testing.

Or

- (b) Explain the detailed process of Magnetic Particle Testing, including preparation, magnetization, particle application, inspection, and demagnetization.

13. (a) Discuss the various coil arrangements used in Eddy Current Testing, including their operating principles, advantages, and industrial applications.

Or

- (b) Explain the working principles and applications of IR detectors and instrumentation in thermographic inspection?

14. (a) Explain the Time-of-Flight Diffraction (TOFD) technique, including its underlying principles, inspection methodology, and benefits in non-destructive testing (NDT) applications.

Or

- (b) Discuss the working principles, advantages and applications of these ultrasonic inspection methods in Non Destructive Testing (NDT).

15. (a) Explain the principles of absorption and scattering of X-rays in radiography, highlighting their impact on image quality, contrast and diagnostic accuracy and discuss techniques to minimize scattering and optimize image quality.

Or

- (b) Describe the principles, advantages and applications of various imaging modalities, including:

- (i) Computer Imaging (e.g., Computed Radiography) (6)
- (ii) Direct imaging (e.g., Digital Radiography). (7)

PART C — (1 × 15 = 15 marks)

16. (a) Case Study: Applying Thermographic Inspection Techniques for Enhanced Predictive Maintenance and Quality Control

Task:

Explain the various thermographic inspection methods to detect defects, anomalies, and potential failures in industrial settings and evaluate their effectiveness in predictive maintenance and quality control.

Or

- (b) Explain the fundamentals of acoustic emission testing, including signal characteristics, instrumentation and applications in non-destructive testing NDT and structural health monitoring.

