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Question Paper Code : 11931

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Seventh/Nineth Semester

Civil Engineering

OML351 — INTRODUCTION TO NON-DESTRUCTIVE TESTING

(Common to Aeronautical Engineering/Aerospace Engineering/Automobile Engineering/Biomedical 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/ 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. Mention any two instruments used in indirect visual inspection.
2. State two advantages of NDT over mechanical testing.
3. State the principle of liquid Penetrant inspection.

4. Name two magnetization methods used in magnetic particle inspection.
5. Differentiate between active and passive thermography.
6. What is infrared radiation?
7. Define pulse echo technique.
8. What is the Kaiser effect?
9. State the inverse square law in radiography.
10. Write any two safety precautions in radiographic testing.

PART B — (5 × 13 = 65 marks)

11. (a) Describe the direct and indirect methods used in visual inspection with suitable instruments.

Or

- (b) A maintenance engineer needs to inspect the internal surface of a turbine blade. Explain the inspection procedure using boroscopes or fibroscopes.
12. (a) Discuss the interpretation and evaluation of indications in magnetic particle testing with neat sketches.

Or

- (b) A steel manufacturing industry needs to detect cracks in ferromagnetic components. Discuss how magnetic particle inspection can be applied.
13. (a) With a neat sketch, discuss the instrumentation and probe arrangements used in eddy current testing.

Or

- (b) With a neat sketch, describe infrared thermography including detectors, instrumentation and applications.

14. (a) Explain A-scan, B-scan and C-scan presentations in ultrasonic testing.

Or

- (b) With a neat sketch, describe the principle, instrumentation and applications of Acoustic Emission Testing.
15. (a) Describe the sources and characteristics of X-rays and gamma rays used in radiographic testing, and explain their significance in non-destructive evaluation.

Or

- (b) Explain and compare the methods of film radiography and digital radiography, highlighting their principles, procedures, and applications in non-destructive testing.

PART C — (1 × 15 = 15 marks)

16. (a) A metal casting plant producing Aluminum components has reported possible surface cracks and discontinuities in some of its products, which may affect their quality and performance. As part of the quality inspection process, the plant plans to apply Liquid Penetrant Testing (LPT) to detect these surface defects. Analyze how liquid penetrant testing can be effectively used to identify cracks and other surface imperfections in the Aluminum components, and explain the steps involved in the testing process.

Or

- (b) During a mechanical loading test on a structural component, engineers observed unusual Acoustic Emission (AE) signals, indicating the possible initiation and propagation of cracks within the material. To ensure structural integrity and prevent potential failure, the engineering team decided to analyze the signals using Acoustic Emission (AE) techniques. As a materials testing expert, evaluate how AE techniques can be applied to detect and monitor crack initiation and propagation in the component during loading. Explain the principles involved and how the collected signals help in identifying defect growth.
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