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UNIVERSITY EXAMINATIONS 2024/2025

THIRD YEAR FIRST SEMESTER EXAMINATION FOR DEGREE OF BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING

EMT 3300: NON-DESTRUCTIVE TESTING OF MATERIALS

DATE: JANUARY 2025 **TIME: 2 HOURS**

INSTRUCTIONS: Question One in Section A is COMPULSORY and answer only one question from Section B and C.

QUESTION ONE (30 MARKS)

a) Define NDT and explain two major applications of NDT in the aerospace and oil & gas industries. (6 marks)

b) Compare Liquid Penetrant Testing (LPT) and Magnetic Particle Testing (MPT) in terms of principles, applications, and limitations. (10 marks)

c) In the context of mechanical engineering, what are the five primary advantages of utilizing NDT methods over destructive testing methods? Support your answer with examples. (5 marks)

d) What are the main advantages of using Nondestructive Testing over destructive testing methods in the evaluation of materials? (2 Marks)

e) Explain the difference between X-ray radiography and Gamma-ray radiography, mentioning two key differences in their application. (7 marks)

SECTION B:

QUESTION TWO (15 MARKS)

a) Discuss the pulse-echo method used in UT and its advantages. (7 marks)

b) Explain the factors affecting sound wave transmission in materials. (8 marks**)**

QUESTION THREE (15 MARKS)

a) Define eddy currents and describe how they are generated. (5 marks)

b) Discuss the importance of material conductivity in eddy current testing. (5 marks)

c) Describe one advantage and one limitation of ECT in detecting subsurface defects. (5 marks)

SECTION C:

QUESTION FOUR (15 MARKS)

a) Explain how the developer in LPT enhances defect detection. (5 marks)

b) Describe two key limitations of LPT and explain how they affect its application. (6 marks).

c) Discuss the difference between dwell time and penetrant removal in LPT. (4 marks)

QUESTION 5 (15 MARKS)

a) Define flux leakage and explain how it is used to detect defects in Magnetic Particle Testing (MPT). (5 marks)

b) Discuss the wet suspension method and its advantages in defect detection. (5 marks)

c) Explain the yoke technique and its application in MPT. (5 marks)