



MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya

Tel: +254(0) 799 529 958, +254(0) 799 529 959, + 254 (0) 712 524 293,

Website: info@must.ac.ke Email: info@must.ac.ke

University Examinations 2024/2025

FIRST YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE IN CEMENT AND CONCRETE

SCT 7124: NONDESTRUCTIVE TESTING OF CEMENTITIOUS MATERIALS

DATE: JANUARY 2025

TIME: 3 HOURS

INSTRUCTIONS: Answer question *one* and any other *two* questions

QUESTION ONE (30 MARKS)

- It is often necessary to test concrete structures after the concrete has hardened to determine whether the structure is suitable for its designed use. Ideally such testing should be done without damaging the concrete. List down ten typical situations where non-destructive testing may be useful. (10 marks)
- Discuss five basic methods for NDT of concrete structures with some typical applications for each method. (5 marks)
- Briefly explain the fundamental principles in radiographic testing (5 marks)
- Ground Penetrating Radar (GPR) has been put to a variety of uses other than concrete, list five such uses (5 marks).
- List down five applications of the infrared thermographic testing method (5 marks)

QUESTION TWO (15 MARKS)

Under Infrared Thermographic method of testing concrete, give an account of the following topics of discussion.

- a) The fundamental working principle (10 marks)
- b) General Procedure for infrared thermographic method (5 marks)

QUESTION THREE (15 MARKS)

- a) Explain how acoustic emissions are applied in NDT (6 marks)
- b) Explain the advantages and limitations of infrared thermography as a method of NDT of concrete (10 marks)

QUESTION FOUR (15 MARKS)

Strain sensing is commonly used to monitor the reaction of a structure or structural elements when subjected to load, e.g., during a full-scale load test. It is also employed to monitor the behaviour or rate of deterioration of structures in service, like crack growth. Discuss this technique under the following topics.

- (i) Mechanical gauges (3 marks)
- (ii) Electrical resistance gauges (4 marks)
- (iii) Acoustic gauges (5 marks)
- (iv) Electrical displacement transducers (3 marks)