



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of BUILDING & Civil engineering
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 4321: ENGINEERING MATERIALS II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Exam booklet, examination pass and student ID

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions

Do not write on the question paper.

QUESTION ONE (COMPULSORY) 30 Marks

- Describe the FIVE main steps involved in the manufacture of Portland cement, highlighting key operations and reactions in each stage. (10 marks)
- Compare natural and artificial pozzolanas with two examples of each. (4 marks)
- Explain FOUR benefits of using pozzolanic materials in concrete. (4 marks)
- Differentiate between the FOUR main types of mortar used in masonry. For each, state typical mix proportions and the advantages or limitations of use. (12 marks)

ANSWER ANY TWO QUESTIONS

QUESTION TWO (20 Marks)

- Using the Vicat apparatus, explain the procedure of the standard consistency test. What factors influence standard consistency, and why is the test important before other cement tests? (12 marks)
- Discuss the influence of aggregate shape and surface texture on the workability and strength of concrete. (8 Marks)

QUESTION THREE (20 Marks)

- a) Explain any THREE characteristics of good quality water for use in concrete. (3 marks)
- b) Describe at least FIVE specific impurities that must be avoided in water used in concrete, and explain how each affects concrete properties. (10 marks)
- c) Define Polymer Modified Cement Concrete (PMC). What are its properties, advantages, and typical areas of application? (7 marks)

QUESTION FOUR (20 Marks)

- a) Explain the EIGHT best practices to be observed during concrete placing to avoid segregation, cold joints, and honeycombing. (10 marks)
- b) Define concrete mix design. Explain FOUR objectives of mix design and list FOUR factors that influence the choice of mix proportions in a concrete mix. (10 marks)

QUESTION FIVE (20 Marks)

- a) Define masonry and explain FOUR types of masonry based on the materials used. (5 marks)
- b) Outline THREE key advantages of using masonry construction in civil engineering. (3 marks)
- c) Explain how moisture content and bulking of sand affect volume batching in concrete. (4 Marks)
- d) Describe FOUR common methods of timber preservation. For each method, indicate the preservative used and a typical application. (8 marks)