



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: JULY 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

- a) Name the FOUR main Bogue compounds formed in cement clinker and provide their chemical formulae. *(4 marks)*
- b) Describe the following specialized cements and their typical uses: *(6 marks)*
 - i) High Alumina Cement
 - ii) Portland Slag Cement
 - iii) Low Heat Cement
- c) Discuss any FIVE standard laboratory or field tests used to assess the quality of bricks. For each test, explain the procedure and the acceptable limits or observations. *(10 marks)*
- d) 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)*

ANSWER ANY TWO QUESTIONS

QUESTION TWO (20 Marks)

- a) Explain the soundness test of cement using the Le Chatelier method. What causes unsoundness, and what are its effects in structures? (8 marks)
- b) 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)

QUESTION THREE (20 Marks)

- a) What is Fibre Reinforced Concrete (FRC)? Discuss the types of fibres used, their influence on mechanical properties, and applications of FRC. (10 marks)
- b) Classify aggregates based on geological origin, size, and shape. For each category, describe the different types, give examples, and explain their significance in construction. (10 marks)

QUESTION FOUR (20 Marks)

- a) Discuss FIVE key factors that influence the selection of concrete transportation methods on site. Provide examples of appropriate transport methods based on these factors. (10 marks)
- b) Explain the effect of sea water on concrete. Under what conditions may sea water be used in concrete, and when is its use prohibited? (10 marks)

QUESTION FIVE (20 Marks)

- a) Describe the process of seasoning timber. Compare natural and artificial seasoning methods, highlighting their advantages, disadvantages, and impact on timber performance. (10 marks)
- b) Discuss the role of deleterious substances in aggregates. Name FOUR such substances, how they are detected, and their effects on concrete quality. (10 marks)