



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
Department of BUILDING & Civil engineering
UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

TCV 4121: ENGINEERING MATERIALS I

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer 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) 20 Marks

- a) Explain the effects of the manganese on properties of steel (2 marks)
- b) Briefly explain the functions of feldspar in the manufacturing process of ceramics (4 marks)
- c) List the raw materials that are charged in the blast furnace during iron making and their functions. (3 marks)
- d) Discuss the importance of the two routes in steel making process (4 marks)
- e) Describe the properties of ceramics that makes them viable structural materials (4 marks)
- f) Plastics are increasingly finding their way in almost all engineering fields. Explain **THREE** advantages of plastics over other Engineering materials (3 marks)



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ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 marks)

- a) Illustrate the notable characteristics of iron and its applications. (4 marks)
- b) Briefly explain the nature and uses of the following polymeric materials (6 marks)
 - i. Elastomers,
 - ii. Semi synthetic plastics
 - iii. Synthetic plastics
- c) Explain the difference between Wrought iron, Cast iron and Pig iron (6 marks)
- d) Describe the following classification of plastics giving **TWO** examples for each
 - i) Thermosets
 - ii) Thermoplastics (4 marks)

QUESTION THREE (20 Marks)

- a) Outline **THREE** major environmental impact associated with steel making process (3 marks)
- b) Explain clearly why high carbon steel is useful in the construction of bridges (2 marks)
- c) With the aid of suitable sketches explain the following plastic moulding techniques
 - i. Compression moulding
 - ii. Injection moulding (7 marks)
- d) Using suitable sketches describe the crystalline structure of steel (4 marks)
- e) Describe how galvanic corrosion occurs and list four protective finishes on metals (4 marks)

QUESTION FOUR (20 Marks)

- a) Compare cold-working and warm working processes used in forming steel products highlighting the advantages and disadvantages of each (6 marks)



- b) Describe glass transition temperature property of polymer (4 marks)
- c) Explain any **FOUR** factors that are responsible for deterioration of polymeric materials (4 marks)
- d) Define the term “Crystallography” as used in solids and explain its usefulness in engineering materials (3 marks)
- e) With the help of a diagram, discuss the life cycle of a material (3 marks)

QUESTION FIVE (20 Marks)

- a) Explain **FOUR** types of defects which occur during welding apart from residual stresses and distortion in the final assembly. (4marks)
- b) Differentiate between Polymer impregnated concrete and Polymer modified concrete. State the area of application for each (4 marks)
- c) Differentiate between brittle and ductile fracture as applied in metallurgy: (2 marks)
- d) Outline **TWO** major environmental impact associated with steel making process (2 marks)
- e) The fracture process of steel normally occurs in several stages, List these Stages. (4marks)
- f) Differentiate between recycling and reducing and mention **FOUR** Significance of Recycling (4 marks)

