



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT BUILDING AND CIVIL ENGINEERING

**UNIVERSITY EXAMINATION FOR:**

**BSC IN CIVIL ENGINEERING**

**ECE 2213: CIVIL ENGINEERING MATERIALS II**

**END OF SEMESTER EXAMINATION**

**SERIES: APRIL 2016**

**TIME: 2 HOURS**

**DATE: 12 May 2016**

## **Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID*

This paper consists of five questions. Attempt question ONE (Compulsory) and any other TWO questions.

## **QUESTION ONE (Compulsory)**

- a) Using suitable sketches describe the crystalline structure of steel (4 marks)
- b) Differentiate between brittle and ductile fracture as applied in metallurgy: (2 marks)
- c) Explain Bauschinger effect on the properties of steel (2 marks)
- d) With the aid of diagrams illustrate **THREE** forms of warping in timber (3 marks)
- e) State the effect of reduced moisture content in timber and outline how it is determined (4 marks)

f) Describe in detail how metals fail by fatigue stating the main features of this kind of failure. (4marks)

g) Differentiate between Polymer impregnated concrete and Polymer modified concrete. State the area of application for each (4 marks)

h) Mention the properties and **TWO** uses of the following types of steel:

i) Mild steel

ii) High carbon steel

iii) Medium carbon steel (6 marks)

### **QUESTION TWO**

a) Describe the **TWO** groups of plastics and for each group state **TWO** areas of applications in engineering (6 marks)

b) Describe briefly **FOUR** hot-working processes used in forming steel products (8 marks)

c) Explain the effects of the following alloying elements on properties of steel:

i) Manganese

ii) Phosphorous

iii) Silicon (3 Marks)

d) State **THREE** advantages of visual strength grading of timber (3 marks)

### **QUESTION THREE**

a) Define seasoning and hence with well labeled diagrams discuss kiln seasoning giving its advantages and disadvantages highlighting any possible defects which could result from the process (8 marks)

b) List **SIX** properties of wood that make it suitable for construction (3 marks)

c) With the aid of appropriate sketches, describe **THREE** methods of manufacturing polymers (9 marks)

#### **QUESTION FOUR**

a) Explain **FOUR** types of defects which occur during welding apart from residual stresses and distortion in the final assembly. (6marks)

b) Using suitable sketches describe the following types of dislocations when steel is stressed

i) Edge dislocations

ii) Screw dislocations (4 marks)

c) Differentiate between self-interstitial atom and substitutional impurity atom in point defects in steel (2 marks)

d) Explain the following terms used in timber

i) Fibre saturation point

ii) Equilibrium moisture content

iii) Partially seasoned timber (3 marks)

e) Explain **FIVE** factors that affect the strength of timber (5 marks)

#### **QUESTION FIVE**

a) Describe how galvanic corrosion occurs and list four protective finishes on metals (4 marks)

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

c) Explain reaction wood and its effect on the structural properties of wood (4 marks)

d) Briefly describe the following properties of plastics and polymers

i) Heat deflection temperature

ii) Moisture absorption

iii) Relative thermal index

iv) Tensile modulus

(6 marks)