MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

ECV 101: MATERIALS SCIENCE

DATE: 2/2/2022 **TIME: 11.00-1.00 PM**

INSTRUCTIONS:

- *This paper comprises of FIVE questions. Answer **THREE** questions*
- *Question one is **compulsory** and carry 30 marks*
- *Answer any other **TWO** questions*

QUESTION ONE (30 MARKS)

a) Define the following terms

i. Alloy (2 marks)

ii. Ionic bonding (2 marks)

iii. Coulombic attraction (2 marks)

iv. Atomic number (2 marks)

v. Hardness (2 marks)

b) You have been requested to select a material to use for football sport shoes, name three important criteria you would use and identify the material that satisfy. (6 marks)

c) A 13.7 mm diameter round sample of carbon steel is pulled to failure in a tensile testing machine. The diameter of the sample was 8.5mm at the fracture surface. Calculate the percent reduction in the area of the sample: (7 marks)

d) Compare the engineering stress and strain with the true stress and strain for the tensile test of a low carbon steel that has the test values in Table 01D: (7 marks)

Table 01D: Tensile Test Values

Load applied to specimen	79000 N
Initial diameter	2.27 cm
Diameter of specimen under 79000 N load	2.20 cm

QUESTION TWO (20 MARKS)

a) Describe the term electropositivity. (6 marks)

b) Discuss and compare Brinell hardness test and Knoops hardness test technique. (14 marks)

QUESTION THREE (20 MARKS)

a) Define malleability and give its importance in material application (6 marks)

b) Describe three main types of fibres used in plastic reinforcements (14 marks)

QUESTION FOUR (20 MARKS)

a) Describe two advantages of polymer materials (4 marks)

b) Describe covalent bonding (6 marks)

c) Differentiate between hot worked materials and cold worked materials (10 marks)

QUESTION FIVE (20 MARKS)

a) Differentiate between strain aging and accelerated strain aging (6 marks)

b) Discuss five properties of concrete as a building material (14 marks)