MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE CIVIL ENGINEERING

SUPPLEMENTARY EXAMINATION

ECV 101: INTRODUCTION TO MATERIALS SCIENCE

DATE: **TIME:**

INSTRUCTIONS

QUESTION ONE

a) i) Define nanomaterials (1 mark)

ii) State the proposed advantages of using nanomaterials over their conventional counterparts. (4 marks)

b) Ductility is extent of plastic deformation that the material undergoes before fracture, describe the two measures of ductility. (10 marks)

c). i) Pure aluminum is a ductile metal with low tensile strength and hardness. its oxide AL2O3 (alumina)is extremely strong, hard and brittle. Explain this difference from an atomic bonding point of view. (5 marks)

ii) A tensile specimen of aluminium alloy is tested to fracture. At the fracture point, it has an engineering stress of 180 MPa and engineering strain 34%. Calculate the true stress and true strain at fracture. (10 marks)

QUESTION TWO

a) Describe the terms

i) metallic radius (1 mark)

ii) Phase diagrams (1 mark)

iii) metalloids (1 mark)

iv) Nucleus charge effect (1 mark)

b) With aid of a schematic, describe the phases in creep -failure test (6 marks)

c) Discuss the checklist for selection of materials used in engineering applications (10 marks)

QUESTION THREE

a) Differentiate between the following mechanical terms in materials

i) Cold working and Hot working (5 marks)

ii) Hammer and Press forging (5 marks)

b) Discuss the major factors that affect the fatigue strength of a metal other than the chemical composition of the metal itself. (10 marks)

QUESTION FOUR

a) Define super plasticity and list the conditions under which super plasticity can be achieved? (4 marks)

b) Differentiate between the tensional, torsional and compressive strengths (6 marks)

c) Compare the three main methods used in hardness testing (10 marks)

QUESTION FIVE

a) i) Differentiate between thermoplastic and thermosets (3 marks)

ii) What the advantages and disadvantages of injection molding (7 marks)

b) With the aid of illustrations, describe the stages in the formation of a cup and cone ductile fracture. (10 marks)