TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN ELECTRICAL & ELECTRONIC ENGINEERING

EME 2103 : MATERIAL SCIENCE I

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 5 HOURS

DATE: Pick Date May 2016

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 any THREE questions.
Do not write on the question paper.

Question ONE

Briefly describe with the aid of diagrams how to determine the following parameters of a   metal specimen under a tension test.

   (a) Yield Stress
   (b) Proof Stress
   (c) Poisson's Ratio
   (d) Young's Modulus of Elasticity, E
   (e) Elastic Limit   (20 marks)

Question TWO

   (a) A cubic structure has six equivalent faces. Assuming a definite orientation of the
        Cube, write down the miller indices of the facial planes of the structure. (6 marks)

(b) Show that the Atomic packing factors for FCC and BCC structures are 0.74 and
0.68 and comment on their effect on properties of the materials. (14 marks)

Question THREE

(a) Explain **THREE** Crystal imperfections and for each give an example. (9 marks)

(b) Distinguish between Metallic bond and Ceramic bond structures. (3 marks)

(c) Give **FOUR** most common space lattices observed in metals and also provide an
example for each. (8 marks)

Question FOUR

Define corrosion. State FOUR prerequisites for corrosion to occur. (4 marks)

(b) Draw a diagram showing an electrochemical cell. (3 marks)

(c) Write two equations representing

(i) Anodic Reaction
(ii) Cathodic Reaction (3 marks)

(d) Explain FOUR methods of corrosion prevention. (6 marks)

(e) With the aid of a sketch show how the Evans diagram represents different
corrosion potentials for metals. (4 marks)

Question FIVE

(a) Explain

(i) Anealing
(ii) Normalising
(iii) Quenching
(iv) Tempering (8 marks)

(b) Describe how to evaluate the toughness of a material. (8 marks)

(c) State **FOUR** Mechanical forming methods. (4 marks)