MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN MECHANICAL ENGINEERING

MATERIAL SCIENCE I

DATE: 31/5/2017 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS

This paper consists of two sections. Section A is compulsory, and then answer any other two questions from section B

SECTION A: COMPULSORY.

1. a) Describe the following mechanical properties;

   i. Tensile strength

   ii. Hardness

   iii. Malleability

   iv. Impact strength

   v. Ductility (10 marks)

   b) Explain the following reference with the internal grain structural changes;

   i. Elastic deformation

   ii. Plastic deformation (4 marks)

c) The crystals of most metals have highly symmetrical structure. Name three common type of lattice, draw there structures and explain the atoms location (12 marks)

d) Explain four characteristics of alloy steels (4 marks)

SECTION B: ANSWER ANY TWO QUESTIONS

2. a) i Define heat treatment in metals (2 marks)

   ii Explain the lower critical temperature in heat treatment (3 marks)

   b) Explain the following and their percentages in carbon steels;

   i. Low carbon steel (3 marks)

   ii. Medium carbon steels (4 marks)

   iii. High carbon steel (4 marks)

   c) Explain the process of carrying out the following heat treatment

   i. Normalizing

   ii. Tempering (4 marks)

3. a) Outline four characteristics of stainless steels (4 marks)

   b) Describe the following stainless steels stating two properties and applications;

   i. Mantensitic stainless steels

   ii. Austenitic stainless steels

   iii. Ferritic stainless steels (6 marks)

4. Describe the following cutting tool materials;

   a) High Speed Steels

   b) Cemented Carbide

   c) Ceramics (20 marks)

5. Name any two methods of manufacturing steel and explain the process of manufacturing (20 marks)