



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)

University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN MECHANICAL
ENGINEERING

MED-PR 109: MATERIAL SCIENCE 1

DATE: 5/8/2016

TIME: 8:30 – 10:30 AM

INSTRUCTIONS:

- This Examination contains two sections A and B.
Section A is compulsory
- Attempt any other Two questions from section B.

SECTION A (COMPULSORY) 30 MARKS

1. a) Describe briefly the following mechanical properties
 - i. Tensile strength
 - ii. Hardness
 - iii. Malleability
 - iv. Impact strength
 - v. Ductility (10 marks)
- b) Explain the following with reference to internal grain structural changes
 - i) Elastic deformation (4 marks)
 - ii) Plastic deformation

- c) Using sketches distinguish between the following crystal lattice structures stating an example of a metal exhibiting such a lattice in each case.
 - i) Face centered cubic (6 marks)
 - ii) Hexagonal close packed (6 marks)
- d) List four desirable properties that may be achieved by alloying of steel. (4 marks)

SECTION B (ATTEMPT ANY TWO QUESTIONS FROM THIS SECTION)

- 2.
 - a)
 - i) Define heat treatment giving a reason why it is necessary. (2 marks)
 - ii) Differentiate between lower and upper critical temperatures in regard to heat treatment of plain carbon steels. (3 marks)
 - b) Describe the three classes of plain carbon steels giving one property and an application for each. (9 marks)
 - c) Describe the following heat treatment processes
 - i) Normalizing
 - ii) Tempering (6 marks)
- 3.
 - a) State four properties of stainless steels which make them have wide applications in the industry. (4 marks)
 - b) Describe the three classes of stainless with regard to their composition, one property and an two applications for each. (12 marks)
 - c) With the aid of a sketch describe the phenomena of weld decay and give two methods of minimizing the defect. (4 marks)
- 4.
 - a) State any four requirements of a good cutting tool material. (4 marks)
 - b) Describe the following cutting tool materials.
 - i. High Speed Steels
 - ii. Stellites
 - iii. Cemented Carbides
 - iv. Ceramics
- 5.
 - a) List any four methods of manufacturing steel (4 marks)
 - b) Explain the four methods named above (16 marks)