



KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER
SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE
ENERGY AND BIO FUELS TECHNOLOGY

COURSE CODE: PRD 212

COURSE TITLE: MATERIAL SCIENCE 1

DURATION: 2 HOURS

DATE: 17/10/18

TIME: 11:30 am

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 4 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

SECTION A: COMPULSORY

QUESTION ONE (30 MARKS)

(a) (i) State THREE methods of altering mechanical properties of metals

(a)(i) Illustrate the THREE most common lattice structures found in metals

(ii) State THREE elements in each of the cases in (a) (i)

(6 marks)

(b) List TWO

(i) mechanical properties of copper

(ii) Applications of Copper

(iii) Types of Copper Alloys

(6 marks)

(c)(i) State FOUR tool steel materials

(ii) State the requirement of the material in (c)(i)

(6 marks)

(d)(i) With the aid of a sketch explain the mechanism of twinning as a deformation process in metals

(6 marks)

(e) Explain the effect of the following elements in carbon steels

(i) Manganese

(ii) chromium

(6 marks)

QUESTION TWO (20 MARKS)

With the aid of an Equilibrium diagramme, describe the formation of a Eutectic mixture with respect to Bismuth-Cadmium alloy

(20 marks)

QUESTION THREE (20 MARKS)

(a)(i) State the main constituents of the Austenitic stainless steels

(ii) State FOUR applications of Ferritic stainless steel

(8 marks)

(b) Explain the phenomenon of GROWTH in cast Irons

(6 marks)

(b) Describe the mitigations in (a)

(6marks)

QUESTION FOUR (20 MARKS)

Explain the phenomenon of precipitation hardening in metals

(20 marks)

QUESTION FIVE (20 MARKS)

(a) With the aid of sketches, describe the following point defects with reference to metals

(i) substitutional

(ii) Vacancy

(iii) Interstitial

(10 marks)

(b)(i) An annealed metal rod has an initial diameter of 20mm. It is drawn down to 18mm. Determine the percentage cold work.

(ii) If the annealed metal rod was first reduced to 19mm before the final diameter of 18mm, through the same process, determine the amount percentage of cold work. (10 marks)