KIBABII UNIVERSITY

2016/2017 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER

Supplementary/Special EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE ENERGY AND BIOFUELS TECHNOLOGY

COURSE CODE: PRD 212

COURSE TITLE: Material Science

DATE: 28/9/2017   **TIME: 10 am – 12pm**

INSTRUCTIONS TO CANDIDATES

Answer question ONE and any other two questions

This paper consists of 3 printed pages. Please Turn over

Q1.(a) (i)State THREE methods of altering mechanical properties of metals

(ii) Illustrate the THREE most common lattice structures found in metals and state THREE elements in each case

(12marks)

(b)List THREE

(i)mechanical properties of aluminium

(ii)Applications of aluminium

(iii)Types of aluminium Alloys

(4.5marks)

(c)(i) State four tool steel materials

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

(4marks)

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

(5 marks)

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

(i) nickel

(ii) chromium

(4.5marks)

SECTION B:ANSWER TWO QUESTIONS FROM THIS SECTION (40 MARKS)

Q2.(i)State Rault's law applied to phase diagrammes

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

(20 marks)

Q3.(a)Explain the phenomenon of GROWTH in cast Irons

(b)Describe the mitigation of the growth in (a)

(c)(i) State the main constituents of the three most common stainless steels

(ii)State FOUR applications of austenitic stainless steel

Q4.Explain the phenomenon of precipitation hardening in metals

Q5.(a) Sketch the following planes from the miller indices given

(i) (111)

(ii) (110)

(iii)(212)

(iv)(010)

(v) (0001)

(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.