



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

SCHOOL OF ENGINEERING AND TECHNOLOGY

**UNIVERSITY EXAMINATIONS FOR THE DEGREE IN SCIENCE IN
RENEWABLE ENERGY TECHNOLOGY AND MANAGMENT**

SECOND YEAR RESIT EXAMINATION 2020/21 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TET 3222

COURSE TITLE: Material Science Ii

EXAM VENUE:

STREAM: BSc REN TECH & MGT

DATE: ../11/2020 EXAM

SESSION:

DURATION: 2 HOURS

Instructions

- 1. Answer question 1 (Compulsory) and ANY other two questions**
- 2. Candidates are advised not to write on question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE**(30 marks)**

- a) With the use of an appropriate diagram, illustrate how corrosion takes place in iron
(6 marks)
- b) With regards to non-ferrous alloys, outline at least three (3) properties in each of the following non-ferrous metals
- I.* Aluminium
 - II.* Copper
 - III.* Titanium
 - IV.* Nickel
- (6 marks)**
- c) Discuss the following structures of the iron-iron carbide (Fe–Fe₃C) phase diagram
(9 marks)
- I.* Ferrite
 - II.* austenite
 - III.* cementite
- d) Discuss the properties and uses of following types of cast iron
- i.* White cast iron
 - ii.* Malleable cast iron
- (6 marks)**
- e) State three (3) purposes of adding alloy elements to plain carbon steels **(3 marks)**

QUESTION TWO**(20 marks)**

- a) Discuss the following different types of plain carbon steels giving their properties and application **(9 marks)**
- I.* Low-carbon steel
 - II.* Medium-carbon steel
 - III.* High-carbon steel
- b) Explain the extraction of aluminium from its ores by the Bayer process outlining the details of every process **(9 marks)**

- c) State two categories of aluminium alloys (2 marks)

QUESTION THREE (20 marks)

- a) Corrosion is a process that causes undesirable effects and in turn affects the integrity of materials. In this regard, discuss four (4) types of corrosions (8 marks)
- b) State and explain the effects of adding Manganese, Nickel, Chromium and Silicon to steel (8 marks)
- c) State and give applications of two (2) alloys of copper (4marks)

QUESTION FOUR (20 marks)

- a) Describe the extraction of copper from copper sulphide ores (10 marks)
- b) Describe four (4) methods used to control corrosion (8 marks)
- c) List any two reasons why iron and steel are widely used in industrial applications (2 marks)

QUESTION FIVE (20 marks)

- a) Discuss four (4) types of case hardening techniques done to steel (8 marks)
- b) Discuss four (4) heat-treatment techniques given to plain carbon steels (8 marks)
- c) State and define any two (2) categories of stainless steel according to predominating microstructures (4 marks)