



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
2ND YEAR 1ST SEMESTER 2017/2018 ACADEMIC YEAR
CENTRE: MAIN CAMPUS

COURSE CODE: TET 3211

COURSE TITLE: MATERIAL SCIENCE I

EXAM VENUE: WS

STREAM: BSc REN ENERGY TECH & MGT

DATE: 18/12/2017

EXAM SESSION: 9.00 - 11.00AM

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) Discuss the influence of bonding on the properties of engineering materials **(8 marks)**
- b) Explain the term corrosion **(2 marks)**
- c) Discuss at least four (4) types of corrosion **(8 marks)**
- d) Briefly explain what you understand by non-destructive testing of materials **(2 marks)**
- e) By use of iron-carbon phase diagram, explain the austenite, cementite and ferrite structures **(8 marks)**
- f) Differentiate between compression and tensional forces **(2 marks)**

QUESTION TWO **(20 marks)**

- a) Using appropriate examples, explain the five (5) different groups in which engineering materials are classified. **(10 marks)**
- b) By the use of an appropriate diagram, illustrate how corrosion takes place in iron **(4 marks)**
- c) Outline six (6) uses of non-destructive testing techniques **(6 marks)**

QUESTION THREE **(20 marks)**

- a) Explain the four important mechanisms by which atoms are bonded in engineering materials. **(12 marks)**
- b) Discuss at least four (4) methods used in heat treatment of steels **(8 marks)**

QUESTION FOUR **(20 marks)**

- a) With the use of an appropriate diagram, explain the tensile-testing of materials **(8 marks)**
- b) Corrosion is a harmful process that interferes with the integrity of material. Explain four (4) methods through which corrosion can be prevented **(8 marks)**
- c) Explain using appropriate examples, the difference between components and phases when dealing with phase diagrams **(4 marks)**

QUESTION FIVE **(20 marks)**

- a) With regards to non-destructive testing techniques and the use of appropriate diagrams, explain liquid penetrant, magnetic particle and ultrasonic methods of inspection **(12 marks)**
- b) With regards to the atomic structure of silver, calculate the number of atoms in 100 g of silver (Ag). The atomic mass of silver is 107.868 g/mol **(3marks)**
- c) Assuming that silica (SiO₂) has 100% covalent bonding, describe how oxygen and silicon atoms in silica (SiO₂) are joined using an appropriate diagram. **(5 marks)**