TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING (DMEN)

EME 2104
MATERIALS SCIENCE

END OF SEMESTER EXAMINATIONS

YEAR 1 SEMESTER 2

SERIES: DECEMBER, 2013

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. You should have the following for this examination:
   - Answer Booklet
   - Scientific Calculator
   - Drawing Instrumentation

2. This paper consists of **FIVE** Questions.
3. Answer **ANY THREE** Questions.
4. All Questions carry equal marks.
5. **This paper consists of THREE printed pages.**

Question ONE

(a) (i) With the aid of a suitable neat sketches explain the **THREE** main states in which substances can exist.

(ii) Differentiate between the **TWO** main classifications of substances.

(8 marks)

(b) (i) Describe with neat sketches the **THREE** main space lattice patterns of metallic materials.

(ii) State any **TWO** metals that posses each lattice given in (bi) above.

(6 marks)

(c) Explain using a neat line diagram the stages undergone by a pure metal cooling from a liquid into a crystalline solid. **(6 marks)**

Question TWO

(a) Discuss the **THREE** main materials engineering properties and state **TWO** examples of each type. **(9 marks)**

(b) Differentiate between the **TWO** main types of metals and give **TWO** examples for each type. **(6 marks)**

(c) With the aid of suitable sketches explain any **FIVE** forms of supply of engineering materials. **(5 marks)**

Question THREE

(a) (i) State any **FOUR** common types of iron ores used for the production of iron and steel.

(ii) Describe the **THREE** main additional charging materials added into the blast furnance and their main functions.

(8 marks)

(b) Illustrate using a block diagram the production process of iron and steel from it's ore into its **FOUR** main ferrous metals. **(6 marks)**

(c) (i) Clearly describe the construction features of the blast furnance.

(ii) Explain how the steel ingot and the slag are removed from the blast furnance.

(6 marks)

Question FOUR

(a) Describe the following **TWO** types of ferrous metals and state the **TWO** properties and **TWO** applications of each.

(i) Grey Cast Iron
(ii) White Cast Iron

(8 marks)

(b) (i) Define the term plain carbon steel.

(ii) Explain the **FOUR** main classifications according to their carbon content for (bi) above.

(6 marks)

(c) (i) Define the term alloy steels and state **FOUR** common alloying elements added to steel.

(ii) Differentiate between heat resistance and corrosion resistance steels.

(6 marks)

Question FIVE

(a) (i) Describe the production process of Alumminium or copper by the Electrolysis method.

(ii) State **FOUR** properties and any **FOUR** forms of supply for any of metal stated in (ai) above.

(8 marks)

(b) (i) Describe the purpose of Destructive Testing (DT) and state any **FOUR** common tests carried out on metallic materials.

(ii) Describe how a metallic material can be tensile tested.

(8 marks)

(c) Differentiate clearly between the **TWO** impact testing methods. **(4 marks)**