



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

CERTIFICATE IN MECHANICAL ENGINEERING

EME 1103 MATERIAL SCIENCE

END OF SEMESTER EXAMINATIONS

SERIES: DECEMBER, 2013

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. You should have the following for this examination:
 - Answer Booklet
 - A non-programmable Scientific Calculator
 - Drawing Instruments
2. This paper consists of **FIVE** Questions.
3. Answer **ANY THREE** Questions.
4. All Questions have equal marks.
5. **This paper consists of TWO printed pages.**

Question ONE

- (a) How do you classify materials for engineering? **(5 marks)**
- (b) What are the factors to be considered for the selection of materials for the design of machine elements? Discuss any three. **(9 marks)**
- (c) Define the following properties of a material:
- (i) Ductility
 - (ii) Toughness
 - (iii) Hardness
- (6 marks)**

Question TWO

- (a) Distinguish clearly amongst cast iron, wrought iron and steel regarding their constituents and properties. **(9 marks)**
- (b) Classify and explain **TWO** different types of cast iron. **(6 marks)**
- (c) Briefly explain how cast iron is obtained. **(5 marks)**

Question THREE

- (a) By definition, distinguish plain carbon steel from alloy steel. **(6 marks)**
- (b) How can the properties of steel be improved? **(4 marks)**
- (c) Discuss the effects of nickel, chromium, tungsten and manganese on steel. **(10 marks)**

Question FOUR

- (a) Briefly discuss the importance of alloying in materials. **(4 marks)**
- (b) Name **THREE** commonly used alloys and states their material constitution. **(6 marks)**
- (c) With the aid of well labeled diagrams, illustrate the following:
- (i) Substitutional solid solutions
 - (ii) interstitial solid solutions
 - (iii) Intermetallic compounds
- (10 marks)**

Question FIVE

- (a) With regards to materials for bearing construction, discuss any **FIVE** important properties. **(10 marks)**
- (b) Discuss any **FOUR** common non-metallic materials. **(10 marks)**