



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

## *Faculty of Engineering and Technology*

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

**DIPLOMA IN MECHANICAL ENGINEERING (PLANT)**  
**DIPLOMA IN AUTOMOTIVE ENGINEERING**  
**DIPLOMA IN CHEMICAL ENGINEERING**  
**DIPLOMA IN MECHANICAL ENGINEERING (PRODUCTION)**

EME 2109: MATERIAL SCIENCE

**SPECIAL/SUPPLEMENTARY EXAMINATION**

SERIES: FEBRUARY/MARCH 2012

TIME: 2HOURS

### **INSTRUCTION TO CANDIDATES**

You should have the following for this examination

- *Answer booklet*
- *Drawing Instruments*

This paper consists of **FIVE** questions.

Attempt any **THREE** questions

Maximum marks for each part of a question are as shown.

This paper consists of **THREE** printed pages

### QUESTION ONE (20 MARKS)

- a) (i) Define the term “Alloy Steels” and state **FOUR** Common Alloying elements to steels  
(ii) State any **FOUR** classifications of Alloy Steels and State **ONE** application for each (8 marks)
- b) (i) Describe the purpose of adding Alloying elements to plain carbon steels; and define Hardenability:  
(ii) State the effects of adding greater amounts of Nickel and Chromium to plain carbon steels (8 marks)
- c) Describe stainless steels and state **TWO** properties and **TWO** applications of Austenitic Stainless steels (4 marks)

### QUESTION TWO (20 MARKS)

- a) (i) Differentiate between Ferrous and Non-Ferrous metals and for each type give **FOUR** examples.  
(ii) State any **FOUR** forms of supply of Non-ferrous metals and **TWO** common properties of such metals (10 marks)
- b) Briefly describe the following methods of Non Ferrous production and state **TWO** applications for each metal.  
(i) Electrolysis of Aluminium  
(ii) Smelting of Copper (10 marks)

### QUESTION THREE (20 MARKS)

- a) (i) Define the term “ plastics” and differentiate between the **TWO** types of plastics  
(ii) State any **FOUR** general properties and **FOUR** main applications of plastics (10 marks)
- b) (i) Describe how the strength of plastics can be improved and modified  
(ii) For each type of plastic in (i) above, give **TWO** examples  
(iii) Clearly differentiate between plastics and rubbers and state their applications (10 marks)

### QUESTION FOUR (20 MARKS)

- a) (i) Describe the term “Destructive Testing” (DT) and give any **FOUR** such tests  
(ii) With the aid of suitable sketches, describe the procedure of Tensile testing and state **FOUR** possible parameters (10 marks)
- b) (i) Explain the term “Toughness”  
(ii) With the aid of suitable illustrations, describe the **TWO** types of Impact Testing Methods (10 marks)

### QUESTION FIVE (20 MARKS)

- a) (i) State **TWO** classifications of bearing materials

- (ii) State any **FOUR** importance properties of bearing materials
  - (iii) Clearly differentiate between “Babbit Metals” and “White Bearing Metals” (10 marks)
- b) (i) Define the term “Corrosion” and state its mechanism
- (ii) Differentiate between “Wet” and “dry” corrosion
  - (iii) State **EIGHT** methods of permanent corrosion prevention methods of steels (10 marks)