



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN

MECHANICAL ENGINEERING

MED-PR 202: MATERIAL SCIENCE II

DATE: 2/6/2017

TIME: 2:00 – 4:00 PM

INSTRUCTIONS

This paper consists of two sections. Section A is compulsory, and then answer any other two questions from section B

SECTION A: COMPULSORY.

1.
 - a) Differentiate between back-heart and white-heart malleable iron (4 marks)
 - b) State FOUR advantages of nitriding (2 marks)
 - c)
 - i Define corrosion (2 marks)
 - ii State any four factors which influence corrosion (4 marks)
 - d) Describe the following timber defects;
 - i. Knots
 - ii. Shakes (4 marks)
 - e)
 - i State four properties of glasses (4 marks)
 - ii State any four applications of glasses (4 marks)
 - f)
 - i Define a composite material (2 marks)
 - ii. Highlight any four properties of composite material (4 marks)

SECTION B: ANSWER ANY TWO QUESTIONS

2. a) Describe the following methods of surface hardening using sketches;
- i. Carburizing in liquid media;
 - ii. Nitriding;
 - iii. Gas carburizing;
 - iv. Induction hardening; (16 marks)
- b) Describe the effects of the following elements on cast iron;
- i. Carbon
 - ii. Manganese (4 marks)
3. Explain the following material testing processes;
- a) Brinell hardness
 - b) Chapy test
 - c) Tensile test
 - d) Creep test (20 marks)
4. a) Discuss the following types of corrosion;
- i. Crevic corrosion
 - ii. De-alloying (4 marks)
- b) Describe the following types of composites with regard to properties, composition and applications for each;
- i. Fibre-reinforced composites
 - ii. Laminated composites
 - iii. Dispersion reinforced composites (12 marks)
- c) Describe the following methods of timber seasoning;
- i. Kiln
 - ii. Air (4 marks)
5. a) Describe the term “growth” as used in cast iron stating its remedy (6 marks)
- b) Describe the following methods of controlling and preventing corrosion;
- i. Plating
 - ii. Modification of corrosive environment
 - iii. Design against corrosion
 - iv. Corrosion inhibitors (6 marks)
- c) Using a sketch, describe the production of aluminium (8 marks)