



# MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN  
MECHANICAL ENGINEERING

MED-PR 219: MATERIAL SCIENCE III

DATE: 2/6/2017

TIME: 8:30 – 10:30 AM

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## 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 Macro and Micro examinations (4 marks)
- b) Define non-destructive testing of materials (2 marks)
- c) i) Define ceramics (2 marks)  
ii) State any four properties of ceramics (4 marks)
- d) Differentiate the following classes of plastics giving TWO examples to each;
  - i. Thermoplastics
  - ii. Thermosetting plastics (4 marks)
- e) i) State four properties of Polymeric materials (4 marks)  
ii) State any four applications of Polymeric materials (4 marks)
- f) Describe briefly the principle of macro-examination (6 marks)

**SECTION B: ANSWER ANY TWO QUESTIONS**

2. Describe the following phase equilibrium diagrams using sketches;
- a) An alloy system of two soluble metals; (6 marks)
  - b) An alloy system of two soluble and insoluble metals; (6 marks)
  - c) An alloy system of two soluble and partially soluble metals; (8 marks)
3. Using sketches explain the following material testing processes;
- a) X- rays method
  - b) Dye penetrant method
  - c) Eddy current
  - d) Magnetic dust method (20 marks)
4. a) Discuss the following joining of ceramic materials;
- i. Diffusion and glaze bonding
  - ii. By coating & brazing and by adhesives (8 marks)
- b) Describe any three applications of and three products of ceramic engineering. (6 marks)
- c) Using sketches describe the etching process in metallography (6 marks)
5. Describe the following types of plastics stating properties, use and its application.
- a) Polyethylene
  - b) Polystyrene
  - c) Urea formaldehyde
  - d) Melamine formaldehyde
  - e) Teflon (20 marks)