



# MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN MECHANICAL ENGINEERING

MED-PR 219: MATERIAL SCIENCE III

DATE: 31/7/2019

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

**SECTION B: ANSWER ANY TWO QUESTIONS**

2. a) Describe the following types of plastics stating properties, use and its application.
- i. Polyethylene
  - ii. Polystyrene
  - iii. Urea formaldehyde
  - iv. Melamine formaldehyde
  - v. Teflon (20 marks)
3. Describe the following methods of surface hardening 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)
4. 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)
5. 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 microstructure examination (6 marks)