



MACHAKOS UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY

**DEPARTMENT OF MECHANICAL & MANUFACTURING
ENGINEERING**
**SECOND YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA
IN MECHANICAL ENGINEERING**

MEDPR219 MATERIAL SCIENCE III

INSTRUCTIONS

TIME: 2 hours

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

SECTION A: COMPULSORY. (30 MARKS)

1. a) Differentiate between Macro and Micro examinations (4 marks)
- b) Define Polymeric materials (2 marks)
- c) i) define ceramics (2 marks)
ii) State any four properties of ceramics (4 marks)
- d) Describe the following classes of plastics;
 - i) Thermosetting
 - ii) thermoplastics (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 micro-examination using a sketch (6 marks)

SECTION B: ANSWER ANY TWO QUESTIONS

2. a) Describe the following thermal equilibrium diagrams using sketches;
 - i. simple eutectic type; (6 marks)
 - ii. combination type; (7 marks)
 - iii. solid solution type; (7 marks)
3. Explain the following material testing processes using sketches;

- i. Ultra-sonic testing
- ii. Eddy current
- iii. Magnetic particles
- iv. Gamma rays method (20 marks)

4. a) discuss the following types of ceramic materials;

- i. crystalline
- ii. non- crystalline (6 marks)

b) Describe any three applications of and three products of ceramic engineering.
(6 marks)

c) Using sketches describe the etching process in metallography (8 marks)

5. a) Describe the following types of plastics stating properties, use and its application.

- i. Urea formaldehyde
- ii. Melamine formaldehyde
- iii. Phenolic formaldehyde
- iv. Polypropylene
- v. Polytetrafluoroethylene (20 marks)