



# MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

CERTIFICATE IN MECHANICAL ENGINEERING (PLANT)

1501/105/MTM: MATERIALS TECHNOLOGY AND METALLURGY

DATE: 3/9/2021

TIME: 11.30-2.30 PM

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## INSTRUCTIONS:

Answer ALL questions

1. (a) Explain FOUR reasons for the different forms of supply of engineering materials.  
(8 Marks)
- (b) Explain each of the following types of materials citing ONE example and TWO uses in each case;
  - (i) Metals;
  - (ii) Ceramics;
  - (iii) Composites; (12 marks)
2. (a) Define each of the following mechanical properties in engineering materials;
  - (i) Malleability;
  - (ii) Hardness;
  - (iii) Ductility;
  - (iv) Toughness; (8 marks)
- (b) Explain each of the following categories of stainless steels giving one use for each case;
  - i) Austenitic stainless steels;
  - ii) Ferritic stainless steels;
  - iii) Martensitic stainless steels. (12 marks)
3. With the aid of a diagram describe and explain the main reactions involved in the extraction of iron from iron ore (Haematite), using coke, limestone and air in a blast furnace.  
(20 marks)

4. (a) In TWO ways describe each of the following types of cast irons and state TWO applications for each;
- (i) Grey cast iron;
  - (ii) Malleable cast iron. (10 marks)
- (b) Explain purpose of each of the following alloying elements of steel:
- (i) Chromium;
  - (ii) vanadium;
  - (iii) Molybdenum
  - (iv) Tungsten
  - (v) Cobalt (10 marks)
5. With the aid of a diagram describe the production of steel using electric arc furnace. (20 marks)