



MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

CERTIFICATE IN MECHANICAL ENGINEERING PRODUCTION(TVET)

MATERIALS TECHNOLOGY & METALLURGY

DATE:

TIME:

INSTRUCTIONS

Answer all questions

1.
 - (a) State two broad classifications of engineering materials. (2 marks)
 - (b) Define the following mechanical properties with regard to Engineering materials.
 - (i) Elasticity.
 - (ii) Ductility
 - (iii) Hardness.
 - (iv) Malleability
 - (v) Tensile Strength (10 marks)
 - (c) Differentiate between the following types of solid materials;
 - (i) Amorphous solids
 - (ii) Crystalline solids (4 marks)
 - (d) Explain the following with reference to structure of materials.
 - (i) Elastic deformation
 - (ii) Plastic deformation (4 marks)
2.
 - (a) Using sketches distinguish between the following crystal lattice structures stating an example of a metal exhibiting such a lattice in each case.
 - (i) Body Centered Cubic
 - (ii) Face centered Cubic
 - (iii) Closely packed hexagonal (12 marks)

- (b) State two effects for each of the following impurities found in cast iron
- (i) Silicon
 - (ii) Phosphorus
 - (iv) Sulphur
 - (v) Manganese (8 marks)
3. (a) List and explain **four** properties of cast iron in Engineering. (8 marks)
- (b) Describe the following types of cast iron stating their composition, one property and an application for each.
- (i) Grey cast iron. (3 marks)
 - (ii) Malleable cast iron. (3 marks)
 - (iii) Nodular cast iron. (3 marks)
 - (iv) Alloy cast iron (3 marks)
4. (a) State and explain five basic parts of a cupola furnace (10 marks)
- (b) With the aid of a sketch explain the process of smelting pig iron in a cupola to obtain cast iron. (10 marks)
5. (a) List three raw materials used in production of pig iron in a blast furnace(3 marks)
- (b) Name two types of iron ores used in pig iron production. (2 marks)
- (c) With the aid of a sketch explain the process which takes place in a blast furnace. (15 marks)