

1501/105

**FABRICATION TECHNOLOGY,  
MATERIALS AND METALLURGY****June/July 2023****Time: 3 hours****THE KENYA NATIONAL EXAMINATIONS COUNCIL****CRAFT CERTIFICATE IN MECHANICAL ENGINEERING  
(PRODUCTION OPTION)****MODULE I****FABRICATION TECHNOLOGY, MATERIALS AND METALLURGY****3 hours**

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**INSTRUCTIONS TO CANDIDATES**

*You should have the following for this examination:*

*Answer booklet;*

*Scientific calculator.*

*This paper consists of EIGHT questions in TWO sections; A and B.*

*Answer FIVE questions taking at least TWO questions from each section.*

*All questions carry equal marks.*

*Maximum marks for each part of a question are indicated.*

*Candidates should answer the questions in English.*

**This paper consists of 4 printed pages.**

**Candidates should check the question paper to ascertain that  
all the pages are printed as indicated and that no questions are missing.**



*Answer at least TWO questions from this section.*

1. (a) State **four** risks caused by inappropriate waste disposal. (4 marks)
- (b) Explain **four** dangers which may arise when workers are not knowledgeable about fire in a workplace. (8 marks)
- (e) Explain **four** benefits of correct use of hand tools. (8 marks)
2. (a) Sketch each of the following:
- (i) a micrometer scale to show a reading of 7.68 mm;
- (ii) a labelled micrometer depth gauge. (6 marks)
- (b) List **four** forming tools used in sheet metal work. (4 marks)
- (c) Describe the procedure for brazing. (4 marks)
- (d) Explain **three** safety precautions to be observed while using mechanical fasteners in the fabrication of a metallic roof. (6 marks)
3. (a) Sketch and label **three** types of oxy-acetylene gas welding flames. (6 marks)
- (b) List **four** components of an oxy-acetylene gas welding equipment. (4 marks)
- (e) With the aid of a sketch, describe the procedure for cutting a mild steel plate using oxy-acetylene gas. (10 marks)
4. (a) Explain the use of each of the following in manual metal arc welding process:
- (i) chipping hammer;
- (ii) wire brush;
- (iii) welding helmet;
- (iv) leather apron. (8 marks)
- (b) Sketch and label a manual metal arc welding connection circuit. (2 marks)



- (c) Illustrate the effects of each of the following on a weld:
- (i) direct current straight polarity (DCSP);
  - (ii) direct current reversed polarity (DCRP). (4 marks)
- (d) explain **three** factors to be considered in selecting a metal finishing process. (6 marks)

### SECTION B: MATERIALS AND METALLURGY

*Answer at least TWO questions from this section.*

5. (a) List **four** physical properties of engineering materials. (4 marks)
- (b) Explain **three** factors that determine the choice of packaging of materials for supply. (6 marks)
- (c) Explain each of the following mechanical properties of engineering materials:
- (i) tensile strength;
  - (ii) plasticity;
  - (iii) ductility. (6 marks)
- (d) Explain **two** differences between a solution and a mixture. (4 marks)
6. (a) With the aid of a diagram, describe the production of steel in the basic oxygen converter furnace. (8 marks)
- (b) Describe white cast iron and state **two** of its uses. (4 marks)
- (c) List **two** mechanical properties of mild steel. (2 marks)
- (d) State **two** effects of each of the following alloying elements in steel:
- (i) tungsten;
  - (ii) chromium;
  - (iii) vanadium. (6 marks)



7. (a) Explain **four** advantages of adhesives over mechanical fasteners. 1501/105 (8 marks)
- (b) List **four** types of rubber. (4 marks)
- (c) State **two** properties of bearing materials. (2 marks)
- (d) Explain **three** properties of copper . (6 marks)
8. (a) Explain each of the following factors in the selection of a corrosion prevention method:
- (i) cost;
- (ii) aesthetics;
- (iii) functionality;
- (iv) environment. (8 marks)
- (b) List **four** methods of preventing corrosion. (4 marks)
- (c) Explain **four** health and safety hazards in the process of heat treatment of metals. (8 marks)

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