

Name: _____ Index No: _____ / _____

1501/105

**STRUCTURAL FABRICATION
TECHNOLOGY, MATERIALS AND
METALLURGY**

June/July 2014

Time: 3 hours

Candidate's Signature: _____

Date: _____



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**CRAFT CERTIFICATE IN MECHANICAL ENGINEERING
(PRODUCTION OPTION)
MODULE I**

STRUCTURAL FABRICATION TECHNOLOGY, MATERIALS AND METALLURGY

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.

Sign and write the date of the examination in the spaces provided above.

You should have the following for this examination:

Scientific calculator;

Drawing instruments.

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

Answer FIVE questions, taking at least TWO questions from each section, in the spaces provided in this question paper.

All questions carry equal marks.

Maximum marks for each part of a question are shown.

Candidates should answer the questions in English.

For Examiner's Use Only

Section	Question	Maximum Marks	Candidate's Score
A		20	
		20	
		20	
B		20	
		20	
		20	
TOTAL SCORE			

This paper consists of 12 printed pages.

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

SECTION A: FABRICATION TECHNOLOGY

Answer at least TWO questions from this section.

1. (a) State any **five** precautions to be observed for good housekeeping. (5 marks)
(b) Identify any **three** safety colours stating their meaning and use in each case. (9 marks)
(c) Explain the purpose of the following tools used in the fabrication of a standard steel door:
(i) straight edge;
(ii) swinging blade protractor;
(iii) steel tape. (6 marks)
2. (a) Illustrate:
(i) draw filing;
(ii) cross filing. (6 marks)
(b) Explain **three** circumstances under which power tools are preferred to hand tools. (6 marks)
(c) (i) Differentiate between hemming and seaming as applied to sheet metal work.
(ii) Illustrate **three** ways of edge treatment in sheetmetal work.
(iii) Sketch and name any **three** types of seam joints. (8 marks)
3. (a) (i) Explain soft soldering.
(ii) Differentiate between passive and active fluxes giving an example in each case, as applied to soft soldering. (6 marks)
(b) (i) List any **three** methods of joining a steel truss structure.
(ii) State any **two** factors to consider when choosing fasteners. (5 marks)
(c) Illustrate the **three** basic oxy-acetylene welding flames. (9 marks)

4. (a) Explain the effect of the following in manual metal arc welding:
- (i) damp electrode coating;
 - (ii) too low welding current;
 - (iii) excessive welding current;
 - (iv) too long an arc.
- (12 marks)
- (b) State **two** factors to consider when choosing a finishing process. (2 marks)
- (c) Explain the following finishing processes:
- (i) bluing;
 - (ii) blackening.
- (6 marks)

SECTION B: MATERIALS AND METALLURGY

Answer at least TWO questions from this section.

5. (a) Define corrosion and state any **four** methods of its prevention. (6 marks)
- (b) State **four** reasons for heat treatment. (4 marks)
- (c) Explain the following heat treatment processes:
- (i) hardening;
 - (ii) normalising.
- (10 marks)
6. (a) Differentiate between physical and mechanical properties of materials. (4 marks)
- (b) Explain the following properties of materials:
- (i) brittleness;
 - (ii) toughness;
 - (iii) strength;
 - (iv) elasticity.
- (8 marks)
- (c) Explain any **four** properties of a bearing material. (8 marks)

7. (a) Sketch and label the cupola furnace. (10 marks)
- (b) (i) List any **two** types of cast irons other than grey cast iron.
- (ii) Give **four** reasons why grey cast iron is widely used in general engineering applications. (10 marks)
8. (a) (i) Differentiate between carbon steel and alloy steel.
- (ii) Explain any **four** improvements in properties that alloy steels possess as compared to carbon steels. (10 marks)
- (b) (i) Differentiate between brass and bronze.
- (ii) Outline **four** properties that make bronzes better than brasses. (6 marks)
- (c) Identify an engineering application for each of the following types of rubber:
- (i) soft rubber;
- (ii) hard rubber;
- (iii) foam rubber;
- (iv) sponge rubber. (4 marks)