

2502/106      2509/106

2503/106

**WORKSHOP TECHNOLOGY  
AND MATERIALS**

Oct./ Nov. 2016

Time: 3 hours



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**

**DIPLOMA IN MECHANICAL ENGINEERING  
(PLANT OPTION), (CONSTRUCTION PLANT OPTION)  
DIPLOMA IN AUTOMOTIVE ENGINEERING**

**MODULE I**

**WORKSHOP TECHNOLOGY AND MATERIALS**

**3 hours**

**INSTRUCTIONS TO CANDIDATES**

*You should have the following for this examination:*

*Answer booklet;*

*Drawing instruments.*

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

*Answer any THREE questions from section A and any TWO questions from section B.*

*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.**

**SECTION A: WORKSHOP TECHNOLOGY (60 marks)**

*Answer any THREE questions from this section.*

1. (a) Explain how the acetylene cylinder is safely recharged. (3 marks)
- (b) Draw a sectional view of a welding torch and label the parts. (7 marks)
- (c) With the aid of sketches, explain the following gas welding techniques:
- (i) leftward welding;
  - (ii) rightward welding.
- (10 marks)
2. (a) Define the meaning of the following finishing and decorative processes:
- (i) pickling;
  - (ii) polishing;
  - (iii) enamelling;
  - (iv) etching.
- (4 marks)
- (b) Explain **four** factors that can contribute to the marketability of a product. (8 marks)
- (c) (i) Explain **three** types of maintenance.
- (ii) Explain the meaning of the following:
- (I) material handling;
  - (II) quality control.
- (8 marks)
3. (a) Sketch the following:
- (i) morse taper sleeve;
  - (ii) drilling set up in a centre lathe.
- (8 marks)
- (b) With the aid of a sketch, explain the procedure of parallel turning in a centre lathe machine. (12 marks)

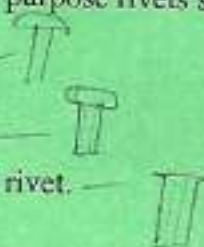
4. (a) Illustrate the following triple riveted lap joints stating an application for each:

- (i) chain riveted;
- (ii) zig-zag riveting.

(4 marks)

(b) Sketch the following general purpose rivets stating an application for each:

- (i) snap head rivet;
- (ii) pan head rivet;
- (iii) flat countersunk head rivet.



(6 marks)

(c) With the aid of sketches, explain the procedure of riveting two plates together.

(10 marks)

### SECTION B: MATERIALS (40 marks)

Answer any **TWO** questions from this section

5. (a) Explain the following properties of materials:

(i) malleability;

(ii) hardness;

(iii) strength;

(iv) toughness;

(v) ductility.

*Ability of material to withstand deformation without fracture.*  
*Ability of material to resist fracture.*  
*Ability of material to resist scratching, wear, penetration, etc.*  
*Property of material to resist fracture due to high impact load like hammer blow, etc.*  
*Property of material to undergo deformation under tension without breaking.*

(5 marks)

(b) (i) State the composition of plain carbon steels.

(ii) State **four** types of plain carbon steels with their percentage carbon content.

*Cast iron, diamond*

(5 marks)

(c) With the aid of a sketch, explain the operation of a 'blast furnace'.

(10 marks)

6. (a) Explain the following heat treatment processes stating an example for each:

(i) induction hardening;

(ii) flame hardening.

(6 marks)

2502/106

2503/106

3

2509/106

Oct/Nov. 2016

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(b) Explain **two** types for each of the following corrosion proofing methods and state an application for each:

- (i) non-metallic coatings;
- (ii) metallic coatings;
- (iii) chemical coatings.

(6 marks)

(c) With the aid of a sketch, explain the following types of corrosion:

- (i) uniform surface corrosion;
- (ii) localised corrosion;
- (iii) crack corrosion;
- (iv) contact corrosion.

(8 marks)

X (a) (i) State **two** advantages of non-ferrous metals.

*High conductivity of electricity  
- easy to manufacture like aluminium*

(ii) List **two** metallic alloys and state two examples for each.

*Alloys: Iron, Chromium, Manganese, Silicon  
Examples: Lead alloy (high radiation ab-  
sorption) - used for X-ray  
Steel - used for 2-4 yrs*

(4 marks)

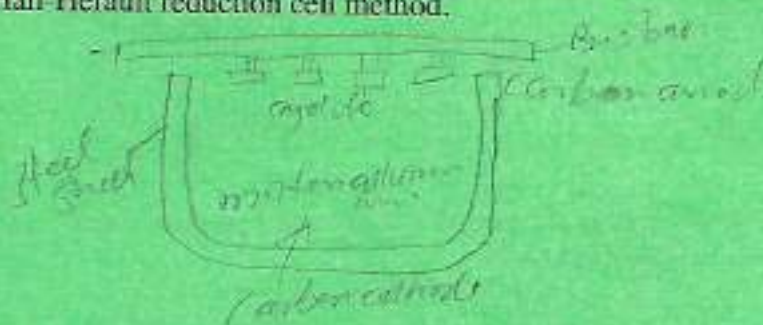
(b) Explain the following and state two examples for each:

- (i) thermoplastics;
- (ii) thermosetting plastics.

(6 marks)

(c) With the aid of a sketch, explain the extraction of aluminium from bauxite using Hall-Herault reduction cell method.

(10 marks)



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