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**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)

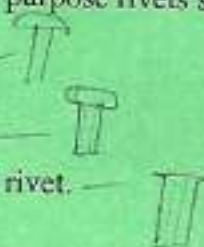
4. (a) Illustrate the following triple riveted lap joints stating an application for each:

- (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, even abrasion. Property of material to resist fracture due to high impact load like hammer blow without causing permanent set. 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)

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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 aluminium like copper*  
*easy to handle or process like aluminium*

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

*chromium, iron, manganese, silicon*  
*alloys: steel, brass, bronze, duralumin, etc.*  
*examples: stainless steel, brass, bronze, duralumin, etc.*

(4 marks)

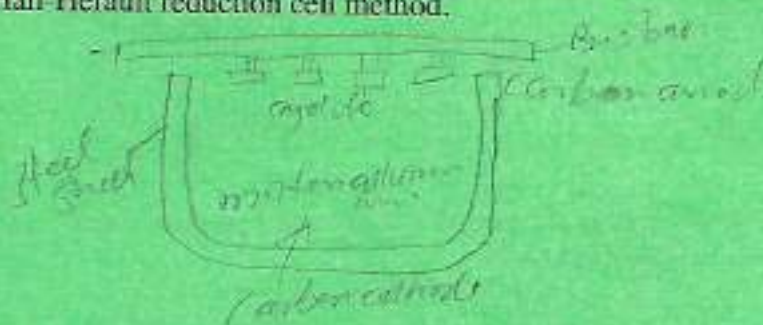
(b) Explain the following and state two examples for each:

- (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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