2502/106
2503/106
2509/106
WORKSHOP TECHNOLOGY, MATERIALS AND METALLURGY
June/July 2022
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

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

MODULE I

WORKSHOP TECHNOLOGY, MATERIALS AND METALLURGY

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 **FIVE** questions taking **THREE** questions from section **A** and **TWO** questions from Section **B**.*
Maximum marks for each part of a question are as 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

*Answer any **THREE** questions from this section.*

1. (a) State **four** safety rules to observe when working in the workshop. (4 marks)

(b) Explain **three** methods of waste disposal and state specific materials considered in each method.

(6 marks)

(c) (i) Describe the following limits and fits processes.

(I) Shrink fit;
(II) Force fit.

State an example of application in each case.

(ii) Explain the following types of tolerances giving an example.

(I) Bilateral tolerance;
(II) Unilateral tolerance.

(10 marks)

2. (a) Illustrate the following gas welding joints:

(i) fillet;
(ii) butt;
(iii) corner.

(6 marks)

(b) Using sketches, explain the following gas welding techniques:

(i) leftward;
(ii) rightward.

(8 marks)

(c) Explain the principle of TIG welding process and state **two** precautions when carrying out the process. (6 marks)

3. (a) Explain the following sheet metal forming processes:

(i) raising;
(ii) beading;
(iii) punching.

(6 marks)

(b) Explain the following finishing processes

(i) lacquering;
(ii) bluing;
(iii) polishing.

(6 marks)

(c) (i) State **four** effects of heat treatment on metals.

(ii) Describe the following heat treatment processes:
(I) hardening;
(II) tempering.

(8 marks)

4. (a) Explain the terms:

(i) maintenance;
(ii) routine maintenance;
(iii) breakdown maintenance.

(5 marks)

(b) (i) State **three** functions of cutting fluids.

(ii) Using a sketch, explain the steps involved in facing a round bar of steel.

(9 marks)

(c) Illustrate the following tools indicating the material each is made from

(i) reamer;
(ii) ball pein hammer.

(6 marks)

SECTION B: MATERIALS AND METALLURGY

*Answer any **TWO** questions from this section.*

5. (a) Describe the following heat treatment processes:

(i) annealing;
(ii) carburizing;
(iii) hardening.

(6 marks)

(b) (i) Explain **two** types of corrosion.

(ii) Describe:

(I) electroplating;
(II) painting.

(10 marks)

(c) Explain **four** properties of bearing materials. (4 marks)

6. (a) (i) State **two** types of rubber.

(ii) Explain **two** methods of wood preservation.

(5 marks)

(b) (i) State **two** properties of aluminium alloy.

(ii) Explain the method of production of aluminium stating **two** of its applications.

(9 marks)

(c) (i) State **two** heat resistant steels.

(ii) Describe Nickel and state **two** of its applications.

(6 marks)

7. (a) Explain **four** types of plain carbon steel and state an application of each. (8 marks)

(b) Explain **two** types of iron ores. (2 marks)

(c) (i) Explain the following terms citing an example of each;

(I) mixture;
(II) compound;
(III) solid solution.

(6 marks)

(ii) Illustrate the following crystal structures:

(I) body centered cubic;
(II) face centered cubic.

(4 marks)

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