2501/105
STRUCTURAL FABRICATION TECHNOLOGY,
MATERIALS AND METALLURGY I
Oct./Nov. 2022
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN MECHANICAL ENGINEERING (PRODUCTION OPTION)

MODULE I

STRUCTURAL FABRICATION TECHNOLOGY, MATERIALS AND METALLURGY I

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet;
Drawing instruments;
Mathematical table / 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 as shown.
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: STRUCTURAL FABRICATION TECHNOLOGY I

*Answer at least **TWO** questions from this section.*

1. (a) List **three** uses of sheet metal in each of the following sectors:

   (i) domestic;

   (ii) industrial. (6 marks)

   (b) Explain **four** safety precautions to be observed when handling sheet metal materials. (8 marks)

   (c) State **three** applications of each of the following methods of joining metals:

   (i) welding;

   (ii) mechanical fasteners. (6 marks)

2. (a) Illustrate **three** types of flames used in oxyacetylene gas welding. (6 marks)

   (b) With the aid of a sketch, describe the procedure for gas cutting of steel. (10 marks)

   (c) Explain the care and maintenance of ballpein hammer. (4 marks)

3. (a) (i) Name **three** types of brazing rods.

   (ii) Describe the procedure for brazing. (8 marks)

   (b) Explain each of the following terms as applied to soft soldering:

   (i) solder;

   (ii) flux;

   (iii) tinning. (6 marks)

   (c) With the aid of a sketch, describe the process of forming a wired edge in a sheet metal work. (6 marks)

4. (a) With the aid of sketches, describe the following tools used in sheet metalwork:

   (i) hatchet;

   (ii) curved tip snips.

   (8 marks)

(b) Figure 1 shows a component to be made from galvanised sheet metal. Draw the pattern development. (12 marks)

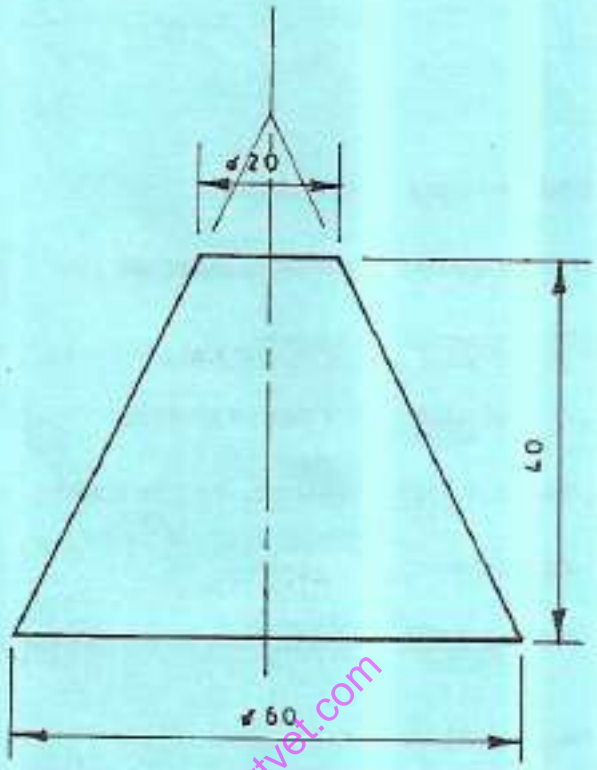

Fig.1

SECTION B: MATERIALS AND METALLURGY I

Answer at least TWO questions from this section.

5. (a) State **four** defects that may arise from heat treatment of iron casting. (4 marks)

(b) With the aid of a sketch, explain the principle of operation of a blast furnace. (12 marks)

(c) State **four** applications of plain carbon steel. (4 marks)

6. (a) State **three** mechanical properties of thermosetting plastics. (3 marks)

(b) Explain **three** processes of wood preservation. (6 marks)

(c) State **two** uses of each of the following engineering materials:

(i) wood;

(ii) rubber;

(iii) plastics. (6 marks)

(d) Sketch and label **two** types of plain bearings. (5 marks)

7. (a) (i) Name **three** types of engineering materials. (3 marks)

(ii) State **five** properties of cast iron. (5 marks)

(b) (i) Explain solid solution as a state of material. (3 marks)

(ii) With the aid of a labelled sketch, describe eutectic material state. (6 marks)

(c) Name **three** applications of alloy steels. (3 marks)

8. (a) With the aid of labelled flow diagram, describe the process of producing copper from its ore.

(10 marks)

(b) Describe each of the following heat treatment processes for steel:

(i) hardening;

(ii) tempering.

(10 marks)

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