1501/105
FABRICATION TECHNOLOGY,
MATERIALS AND METALLURGY
Oct. / Nov. 2022
Time: 3 Hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN MECHANICAL ENGINEERING
(PRODUCTION OPTION)

MODULE I

FABRICATION TECHNOLOGY, MATERIALS AND METALLURGY

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
    Answer booklet;
    Drawing instruments;
    Mathematical tables/ Scientific calculator.
This paper consists of 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 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.

Turn over

SECTION A: FABRICATION TECHNOLOGY

Answer at least TWO questions in this section.

1. (a) (i) State **three** benefits of fire fighting.

       (ii) List **two** items contained in a first aid box. (5 marks)

   (b) Explain **three** consequences of wrong first aid procedures. (6 marks)

   (c) State **two** safety precautions to be observed when using an anvil. (2 marks)

   (d) (i) Sketch and label a depth micrometer.

       (ii) Sketch a micrometer scale with a reading of 10.72 mm. (7 marks)

2. (a) List **four** marking out tools used with a surface plate. (4 marks)

   (b) State **four** methods of material removal applied when fabricating a square shaped nut from a round bar on the bench. (4 marks)

   (c) Explain **four** sheet metal operations used in the fabrication of a cabinet. (8 marks)

   (d) Explain **two** ways to care for and maintain soldering tools and equipment. (4 marks)

3. (a) State **four** checks to be carried out on the oxy-acetylene gas welding equipment before opening the cylinder valves for welding. (4 marks)

   (b) With the aid of sketches, describe the procedure for welding of a lap joint between two mild steel plates of thickness 3 mm using oxy-acetylene gas welding process.

                                                 (10 marks)

   (c) Explain **three** precautions to be observed against hazards from brazing fumes.

                                                 (6 marks)

4. (a) List **three** mechanical fasteners. (3 marks)

   (b) (i) List **three** types of materials used for fabrication of mechanical fasteners.

       (ii) Explain **three** factors that influence the selection of materials for mechanical fasteners. (9 marks)

   (c) State **two** causes of defects in manual metal arc welding. (2 marks)

   (d) Explain **three** ways of caring for and maintaining the manual metal arc welding equipment. (6 marks)

SECTION B: MATERIALS AND METALLURGY

Answer at least TWO questions from this section.

5. (a) List **four** charge materials for a cupola furnace. (4 marks)

   (b) Explain the working principle of a cupola furnace. (4 marks)

   (c) Define each of the following states of materials:

   (i) solid solution;

   (ii) liquidus;

   (iii) solidus. (6 marks)

   (d) Explain **three** advantages of having different engineering materials. (6 marks)

6. (a) State **four** applications of cast iron. (4 marks)

   (b) Explain **three** reasons that make mild steel the most commonly used steel. (6 marks)

   (c) Explain the reasons for use of stainless steel in each of the following fields:

   (i) food and catering;

   (ii) bridges;

   (iii) power plants. (6 marks)

   (d) List **four** elements that can be used to alloy steels. (4 marks)

7. (a) List **three** types of non-ferrous metal alloys. (3 marks)

   (b) Explain **four** areas of application of plastics in machines. (8 marks)

   (c) List **three** products made from elastomers. (3 marks)

   (d) Explain **three** uses of wood in engineering. (6 marks)

8. (a) State **two** functions of bearings in machines. (2 marks)

   (b) State **four** advantages of metal spraying over painting. (4 marks)

   (c) Explain the **three** stages of heat treatment of metals. (6 marks)

(d)   Describe each of the following quenching methods used in heat treatment of metals:

        (i)   water quenching;

        (ii)   air quenching;

        (iii)   brine quenching.   (8 marks)

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