

2910/105

AGRICULTURAL ENGINEERING I

June/July 2022

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN SUSTAINABLE AGRICULTURE
AND RURAL DEVELOPMENT

AGRICULTURAL ENGINEERING I

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Technical drawing instruments;

Drawing paper size A3;

Non-programmable scientific calculator;

Answer booklet.

This paper consists of EIGHT questions.

Answer question ONE (COMPULSORY) and any other FOUR questions in the answer booklet provided.

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 3 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) Construct a rectangle equal in area to a triangle of sides 80 mm by 100 mm by 67 mm. (8 marks)
- (b) Figure 1 shows three views of an engineering component not drawn to scale in first angle orthographic projection.

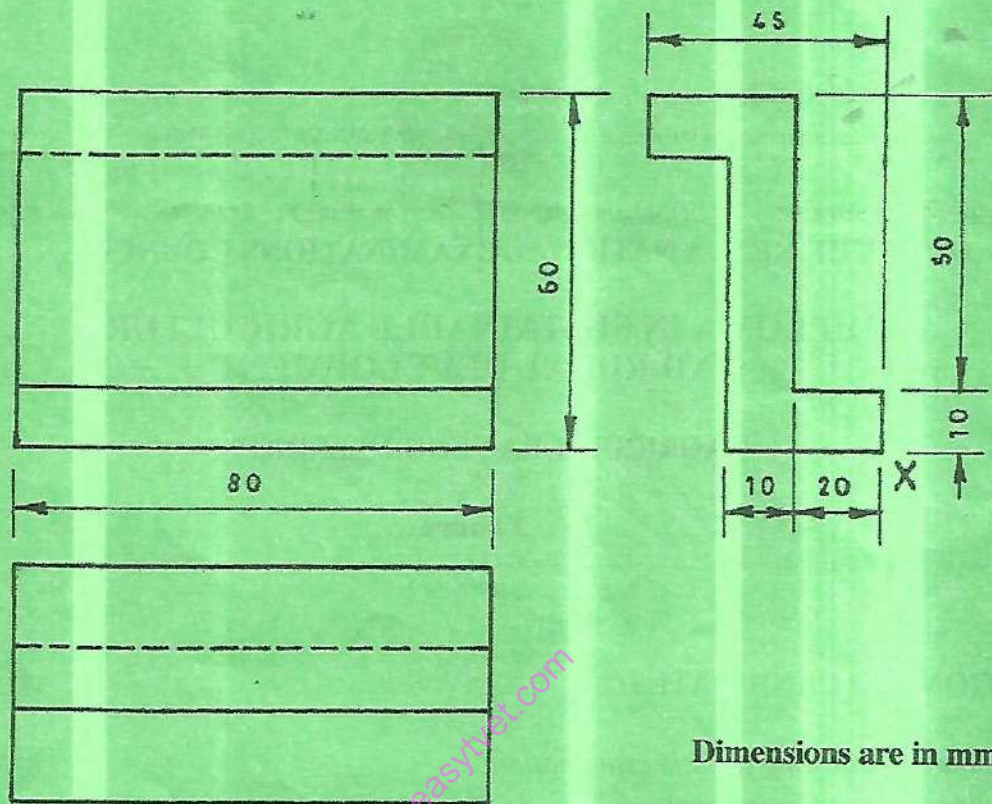


Fig. 1

Draw full size, the isometric view of the component with corner X as the lowest point and indicate **three** dimensions. (12 marks)

- 2 (a) Explain **four** roles of agricultural engineering in promoting sustainable agriculture. (8 marks)
- (b) State **four** benefits of a farm workshop. (4 marks)
- (c) Outline **four** characteristics of a good farm workshop layout. (8 marks)
- 3 (a) Explain **four** common safety hazards in agricultural engineering workshops. (8 marks)
- (b) Describe **four** actions that can be taken to minimise accidents due to mechanical failures of farm machines and implements. (8 marks)
- (c) Highlight **four** safety precautions to be observed when operating tractor P.T.O. powered implements. (4 marks)

4. (a) Highlight **three** advantages and **three** disadvantages of each of the following sources of farm power:
- (i) biogas;
 - (ii) electricity.
- (12 marks)
- (b) Explain **four** managerial actions that can be taken so as to obtain optimum work output from draft animals. (8 marks)
5. (a) Define each of the following engine operating terms:
- (i) swept volume;
 - (ii) clearance volume;
 - (iii) compression ratio;
 - (iv) stroke.
- (4 marks)
- (b) Using labelled sketches, explain the principles of operation of a two stroke cycle spark ignition engine. (16 marks)
6. (a) State **four** roles of a differential unit in a tractor engine power transmission system. (4 marks)
- (b) With the aid of a labelled sketch, explain the operation of a tractor differential unit. (16 marks)
7. (a) Explain **five** limitations facing farm mechanization in sustainable agriculture. (10 marks)
- (b) Draw a schematic diagram to illustrate the components of a boom sprayer. (7 marks)
- (c) Outline **three** factors that influence the application of a boom sprayer. (3 marks)
8. (a) Using a labelled sketch, explain the operation of a flail type forage harvester. (14 marks)
- (b) State **two** possible positions of attaching a forage harvester to a tractor, giving **two** advantages of each. (6 marks)

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