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2425/104
AGRICULTURAL ENGINEERING I
Oct./Nov. 2018
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AGRICULTURE

MODULE I

AGRICULTURAL ENGINEERING I

3 hours



INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Drawing instruments;

Non-programmable scientific calculator.

*This paper consists of **THREE** sections; **A, B and C.***

*Answer a total of **FIVE** questions, taking at least **ONE** question 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 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.

SECTION A

Answer at least ONE question from this section.

1. (a) Describe any five shapes of workshop files, giving one application for each. (15 marks)
- (b) State any five maintenance requirements for workshop files. (5 marks)
2. (a) With the aid of a labelled diagram, explain the working principle of electric arc welding. (12 marks)
- (b) Explain the effects of each of the following on the quality of weld produced by a manual electric arc welding process:
 - (i) electrode selection;
 - (ii) variation in welding current;
 - (iii) arc length;
 - (iv) welding speed.



SECTION B

Answer at least ONE question from this section.

3. (a) State any three functions of a differential unit in a tractor power transmission system. (3 marks)
- (b) With the aid of a labelled sketch, explain the operation of a tractor differential unit. (17 marks)
4. (a) A tractor engine piston has a crown diameter of 14 cm and a stroke of 13 cm. Calculate the swept volume of the piston and the capacity of the engine if it has four cylinders. (6 marks)
- (b) With the aid of labelled sketches, explain the principle of operation of a two stroke cycle spark ignition engine. (14 marks)
5. (a) Give any four operational functions of a three point hitch linkage of a farm tractor. (4 marks)
- (b) With the aid of diagrams, describe any four types of tractor PTO drive arrangements, giving one application for each. (16 marks)



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SECTION C

Answer at least ONE question from this section.

6. (a) List any **four** applications of a chisel plough in agriculture. (4 marks)
- (b) Draw a labelled diagram of a tractor mounted one bottomed mould board plough. (8 marks)
- (c) Explain how each of the following tractor mounted mould board plough adjustments are effected:
- (i) ploughing depth;
 - (ii) front furrow width;
 - (iii) front furrow depth;
 - (iv) pitch of plough.
7. (a) Outline any **four** operational requirements of a fertilizer distributor. (4 marks)
- (b) With the aid of a labelled sketch, explain the operation of a reciprocating plate fertilizer distributor. (12 marks)
- (c) Outline any **four** safety requirements for PTO drives. (4 marks)
8. (a) With the aid of a labelled sketch, explain the operation of a cup feed seed dispensing mechanism of a planter. (12 marks)
- (b) State **two** advantages and **two** disadvantages of a cup feed planter seed dispensing mechanism. (4 marks)
- (c) A seed plate and the ground wheel of a planter have a seed plate to ground wheel speed ratio of 1:3. Determine the seed to seed spacing within the row, if the effective ground wheel diameter is 54.46 cm and the seed plate has 20 cells at its periphery. (4 marks)



Handwritten sketches and notes on the bottom half of the page:

- On the left, a vertical pipe with a hopper below it, labeled "reductor suspension of power transmission".
- In the center, a horizontal plough-like mechanism with a curved mouldboard, labeled "1. front curb".
- To the right, a diagram of a cup feed mechanism with a hopper and a rotating plate, labeled "Kednu: down teen up" and "Power".
- Below the cup feed diagram, another similar diagram is shown.
- At the bottom center, the text "THIS IS THE LAST PRINTED PAGE" is printed.
- Handwritten notes at the bottom include "3", "Vadaba 2,00 2x4", and "Ladde 15 005".