

UNIVERSITY OF KABIANGA  
UNIVERSITY EXAMINATIONS  
2016/2017 ACADEMIC YEAR  
**SECOND YEAR FIRST SEMESTER EXAMINATIONS**  
**FOR THE DEGREES OF BACHELOR OF SCIENCE**  
IN  
**AGRICULTURE, AGRICULTURAL ECONOMICS AND RESOURCE  
MANAGEMENT, HORTICULTURE AND AGRICULTURAL EXTENSION  
EDUCATION**

**ABE 281: AGRICULTURAL POWER AND MACHINERY**      **TIME: 3 HOURS**  
**INSTRUCTIONS TO CANDIDATES: Attempt questions ONE and any other FOUR  
questions.**

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- Q1. a) Distinguish between the terms “cultivation” and “tillage” as applied in agricultural science. (2 marks)
- b) Explain four types of tillage systems used in farming technology. (2 marks)
- c) Explain the effects of ploughing in tillage operations. (2 marks)
- d) Describe the following tillage <sup>operations</sup> ~~implements~~ giving examples of each.
- i) Primary. (1 mark)
  - ii) Secondary. (1 mark)
  - iii) Cultivating. (1 mark)
  - iv) Combination primary. (1 mark)
  - v) Combination Secondary. (1 mark)
- e) Illustrate three different configurations in disc harrows. (3 marks)
- f) Define the term “farm mechanization” stating its major aims in Kenya. (3 marks)
- g) Modern farming system faces several challenges towards transforming mechanized agriculture. Briefly discuss. (3 marks)
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- Q2. a) Define the term “Muck Spreader”. (1 mark)
- b) Describe the operation of muck spreaders in agricultural operations. (3 marks)
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- c) State five factors considered in efficient handling of manure application equipments. (5 marks)
- d) Describe the mechanisms of the following manure spreader distributors used in spreading manure on the farm.
- i) Broadcast distributor. (2 marks)
  - ii) Single nozzle manure distributor. (2 marks)
  - iii) Low profile spreading distributor. (2 marks)
- e) List four categories of sprayers classified on the basis of energy employed to atomize and eject the spray fluid. (2 marks)
- g) State the uses of sprayers and dusters in agriculture. (3 marks)
- Q3. a) Briefly discuss various sources of power in agriculture. (6 marks)
- b) State the merits and demerits of the following farm power sources.
- i) Human power. (2 marks)
  - ii) Animal power. (2 marks)
  - iii) Mechanical power. (2 marks)
  - iv) Electrical power. (2 marks)
- c) Compare between tractor/power tiller and animal power. (2 marks)
- d) Determine the power requirement to pull a six bottom 30cm mould board plough working to a depth of 20cm. The tractor is operated at a speed of 8km/h and the soil resistance is  $0.7\text{kg/cm}^2$ . (4 marks)
- Q4. a) Distinguish between seed rate and seed spacing. (1 mark)
- b) State the functions of seed-drills and planters in agricultural operations. (4 marks)
- c) Describe any two types of metering devices used on seed drills/ planters. (4 marks)
- d) Given a seed drill 2.5m wide and a ground wheel 1.25m diameter and if out of 20 counters only half are used to collect 0.6kg of seed after 10 rotations. Calculate the seed rate. (5 marks)
- e) Explain the limitations of traditional sowing methods. (6 marks)

- Q5. a) State the reasons why internal combustion engines are quite different from external combustion engines. (2 marks)
- b) Compare compression ignition and spark ignition engines. (4 marks)
- c) Differentiate a 2-stroke and 4-stroke engine. (4 marks)
- d) A CI oil engine developed an indicated power of 51kW when using 0.18kg of fuel per minute having a calorific value of 45MJ/kg. Pumping and friction losses reduce the indicated power by 11Kw. Calculate:
- i) The brake power. (2 marks)
  - ii) The mechanical efficiency. (2 marks)
  - iii) The specific fuel consumption. (3 marks)
  - iv) The brake thermal efficiency. (3 marks)
- Q6. a) Explain the term "Power Transmission" (1 mark)
- b) State the functions of power transmission system in a tractor. (3 marks)
- c) Explain the importance of the following components in power transmission.
- i) Clutch. (1 mark)
  - ii) Transmission gears. (1 mark)
  - iii) Differential. (1 mark)
  - iv) Final drive. (1 mark)
  - v) Rear axle. (1 mark)
  - vi) Rear wheels. (1 mark)
- d) A gearbox has an input speed of 1500 rev/min clockwise and an ~~input~~<sup>output</sup> speed of 300 rev/min anticlockwise. The input power is 25kW and the efficiency is 70%.
- Determine the following:-
- i) The gear ratio. (2 marks)
  - ii) The input torque. (2 marks)
  - iii) The output power. (2 marks)
  - v) The output torque. (2 marks)
  - vi) The holding torque. (2 marks)