**UNIVERSITY OF KABIANGA**

**UNIVERSITY EXAMINATIONS**

**2017/2018 ACADEMIC YEAR**

**SECOND YEAR FIRST SEMESTER EXAMINATION**

**FOR THE DEGREE OF BACHELOR OF SCIENCE IN HORTICULTURE/BACHELOR OF SCIENCE IN AGRICULTURAL EXTENSION EDUCATION AND AGRICULTURAL ECONOMICS AND RESOURCE MANAGEMENT.**

**COURSE CODE: ABE 211/281**

**COURSE TITLE: AGRICULTURAL POWER AND MACHINERY.**

**DATE: 5/2/2018**

**TIME: 2.00 P.M-5.00 P.M**

**INSTRUCTIONS:**

Attempt question **ONE** and any other **FOUR** questions.

**Question One**

a) Distinguish between the terms "cultivation" and "tillage" as applied in agricultural science. (2 marks)

b) Explain the following four types of tillage systems used in farming technology: (4 marks)

i. Intensive

ii. Reduced

iii. Conservation

iv. Zonal

c) Explain the positive effects of ploughing in tillage operations. (2 marks)

d) Describe **FIVE** tillage operation implements giving examples in each case. (5 marks)

e) Transforming agriculture is KEY to development growth. Discuss in the context of mechanization the main challenges faced in Kenya today. (4 marks)

f) Briefly discuss the major aims of mechanized agriculture on Kenya. (3 marks)

**Question Two**

a) Define the following terms as used in farm machinery:

i. Field capacity. (2 marks)

ii. Field efficiency. (2 marks)

b) A tractor is used to pull a 7.3m tandem disk at 9.6 km per hour with a field efficiency of 80%.

i. Calculate its field capacity. (3 marks)

ii. Width of the implement. (3 marks)

c) List **FOUR** categories of sprayers classified in the basis of energy employed to atomize and eject the spray fluid. (2 marks)

d) Dusters are classified according to those which are manually operated and power operated. Describe the types of dusters in each category. (4 marks)

e) State the uses of sprayers and dusters in agriculture. (4 marks)

**Question Three**

a) Define the term "honey wagon." (1 mark)

b) State the advantages and disadvantages of the following calibration methods of the following manure spreaders:

i. Tarp. (3 marks)

ii. Swath width and distance. (3 marks)

iii. Loads per field. (3 marks)

c) The farm manager at University of Kabianga had 6000 kilograms (6 tonnes) of manure to spread on a known field of size of 5.6 hectares. The manager had 24 loads of manure to spread on the entire field. What is the application rate per hectare? (5 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 0.7kg/cm^2. (4 marks)

**Question Four**

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)

**Question Five**

a) State the reasons why internal combustion engines are quite different from external combustion engines. (2 marks)

b) Define the following terms: (4 marks)

i. Compression Ratio

ii. Firing order

iii. Engine bore

iv. Engine stroke

c) Differentiate a 2-stroke and a 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)

**Question Six**

a) Explain the term "Power Transmission" (1 mark)

b) State the functions of power transmission system in a tractor. (4 marks)

c) A gearbox has an input speed of 1800 rev/min clockwise and an output speed of 400 rev/min anticlockwise. The input power is 30kW and the efficiency is 80%.

Determine the following:

i. The gear ratio. (3 marks)

ii. The input torque. (3 marks)

iii. The output power. (3 marks)

iv. The output torque. (3 marks)

v. The holding torque. (3 marks)