



"Investing in Africa's Future"

**COLLEGE OF SOCIAL SCIENCES, HUMANITIES, THEOLOGY &
EDUCATION**

AAE 201: POWER AND MACHINERY

END OF SECOND SEMESTER EXAMINATIONS

January 2018

LECTURER: MR. W. ZENDERA

DURATION: (3HRS)

INSTRUCTIONS

1. Answer any FIVE Questions

2. Use Answer Sheets Provided

3. Begin Your Answer for Each Question on a New Page

4. Credit is Given for Neat Presentation



Answer Any **FIVE** Questions

Question 1

- a) When to replace or trade a machine is one of the more difficult decisions in machinery management. Discuss some of the reasons that can make you decide to replace machinery at your farm. [10]
- b) Suppose Mr Mpofu plants 150 ha of potatoes per year with an average yield of 3 000 kg/ha. Currently he uses seasonal labourers to dig the potatoes at a cost of \$1.50 per 10kg pocket. Mr Mpofu is now considering the purchase of a mechanical potato digger to replace seasonal labourers. A new potato digger costs \$6 000 and after a useful life of 5 years he can sell it for \$2 000. The variable costs are \$3/ha, and costs incurred due to yield and quality losses amount to \$24/ha.
- Is the replacement of labour by a potato digger economically justifiable at the present scale of production? [5]
 - What is the minimum scale of production that will make the replacement economically justifiable? [5]

Question 2

- a) Define the following terms:
- Effective field capacity, [2]
 - Theoretical field capacity, and [2]
 - Material capacity. [2]
- b) A recent agric graduate has been given a 45 ha piece of land by her parents. After clearing the land she considers hiring her neighbours tractor to plough the entire land. The neighbor has a relatively new 3 disc plough which gives a cut of 0.4 m/disc. The tractor driver is instructed to maintain a speed of 4 km/hr. Assuming field efficiency of 70%, calculate:
- Theoretical field capacity, [4]
 - Effective field capacity, and [5]
 - Number of hours required to finish ploughing. [5]

Question 3

- a) State the advantages of a disc plough over a mouldboard plough [5]
- b) What effect do the following adjustments have on a disc plough: [5]
 - i. Disc angle and
 - ii. Tilt angle.
- c) Describe the static method of calibrating a spinning disc fertilizer spreader. [4]
- d) State three factors which affect the application rate of a spinning disc fertilizer spreader. [6]

Question 4

- a) With reference to farm machinery define maintenance in detail. [5]
- b) State four main objectives of maintaining farm equipment. [4]
- c) With reference to any farm enterprise of your choice:
 - i. List the major equipment that they own, [3]
 - ii. Describe the three major maintenance strategies that they use, and state the advantages and disadvantages of each of the methods. [8]

Question 5

- a) List five sustainable technologies that can be adopted to address rural energy challenges in a rural set up. [5]
- b) What is an energy audit [2]
- c) Explain hybrid energy systems and give their advantages [8]
- d) What factors would you consider before deciding on an energy source to adopt? [5]

Question 6

- a) Briefly describe the purpose of each of the following tractor accessories. [10]
 - i. Cabs,
 - ii. Three point linkage,
 - iii. External hydraulics,
 - iv. Differential locks, and
 - v. Independent brakes.
- b) Discuss the functions of the lubrication system. [7]
- c) What precautions should be taken when switching from a non-detergent to a detergent oil? [3]