



**UNIVERSITY OF ESWATINI
MAIN EXAMINATION PAPER**

PROGRAMME: BSc AGRICULTURAL AND BIOSYSTEMS ENGINEERING 1

COURSE CODE: ABE101

TITLE OF PAPER: AGRICULTURAL ENGINEERING PRINCIPLES

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

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CHIEF INVIGILATOR

SECTION 1: COMPULSORY QUESTION

QUESTION 1

- a. Discuss four (4) advantages of animal power over human and tractor power [20 marks]
- b. Explain why these factors should be considered when choosing an irrigation system:
- Quality of water [4 marks]
 - Size of area to be irrigated [4 marks]
 - Type of crop [4 marks]
 - Type of soil [4 marks]
 - Value of crop being irrigated [4 marks]

SECTION II: ANSWER ANY TWO (2) QUESTIONS

QUESTION 2

- a. What are the two categories of mechanics that are used in agricultural engineering? [1 marks]
- b. What are the three (3) equations of static equilibrium? [2 marks]
- c. Calculate the magnitude of the forces **R**, and **L** in Figure 1. [2 marks]

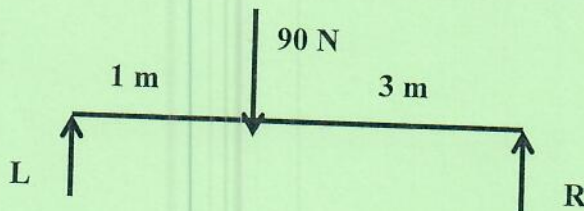


Figure 1: Concrete ring beam loading.

- d. Describe with the aid of a diagram how the electromagnetic distance measurement (EDM) instruments operate. [5 marks]
- e. The dimensions of the maize field could have been measured accurately and faster with an electromagnetic distance measurement (EDM). The EDM utilizes equation 1 to determine the distance in question.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} \quad (1)$$

Given that the speed was 100 m/s and it took 9.7 seconds for the signal to be returned to the emitter, calculate the distance that was measured by the EDM.

[4 marks]

- f. Discuss in detail how the surveyor's level was developed from a basic physics liquid principle to be what it is today. [6 marks]
- g. List five indicators of a warming world [5 marks]
- h. List five effects of climate change to agriculture [5 marks]

QUESTION 3

- a. Explain why drying grains is considered a loss to a farmer [2marks]
- b. State four reasons for processing agricultural produce [4marks]
- c. Name four common methods of drying grains [4marks]
- d. Explain what hazardous waste is? [5 marks]
- e. Describe five (5) properties of hazardous waste. [15 marks]

QUESTION 4

- a. What external features distinguish between a 2 wheel-drive and a 4 wheel-drive tractor? [5 marks]
- b. Explain why tractors are restricted to a maximum speed of 40 kph. [5 marks]
- c. With the aid of a diagram explain the 'fire triangle' that is necessary for propagating fire. [5 marks]
- d. An accident at the University Workshop has caused a petrol storage tank to burst and catch a fire. A colleague runs to the fire hydrant and wants to extinguish the fire using water. Explain to the colleague the dangers of using water to extinguish the fire at the workshop. [5 marks]
- e. Using examples, explain what sustainable waste management is? [10 marks]