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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SECTION 1: COMPULSORY QUESTION

QUESTION 1

a.   Savvy consumers have high expectations. Give three key attributes of food characteristics they expect to get from producers.   **[6 marks]**

b.   Name three key decisions that affect a post-harvest marketing and management plan.

[8 marks]

c.   Discuss five (5) factors that form criteria for the selection of agricultural tractors

[20 marks]

d.   What are the two categories of mechanics that are used in agricultural engineering?

[1 mark]

e.   Which of these categories (d) is used in agricultural structures to resolve forces and the ultimate design of buildings and structures?   **[1 mark]**

f.   What are the three (3) equations of static equilibrium?   **[2 marks]**

g.   Calculate the magnitude of the forces **R**, and **L** in **Figure 1**.   **[2 marks]**
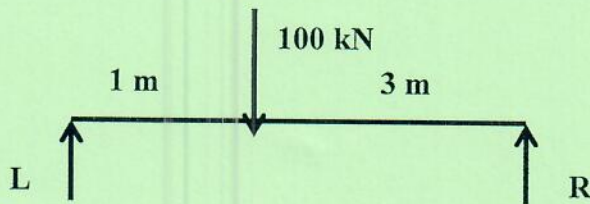
Figure 1. Concrete ring beam loading.

SECTION II: ANSWER ANY TWO (2) QUESTIONS

QUESTION 2

a.   List seven signs of global warming   **[7 marks]**

b.   Describe with the aid of a diagram how the electromagnetic distance measurement (EDM) instruments operate.   **[5 marks]**

c.   The dimensions of the maize field could be measured accurately and faster with an electromagnetic distance measurement (EDM). The EDM utilizes equation 1 to determine the distance in question.

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

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.   **[3 marks]**

d.   State the basic principle of an optical linear measurement land surveying instrument.

[2 marks]

e.   A surveyor's level was used to measure a dam embankment. The upper stadia were read as 4.820 while the lower stadia were 1.010 m. Calculate the length of the embankment.

[3 marks]

f.   Distinguish between thermoplastics and thermosetting plastics.   **[3 marks]**

g.   Define three properties that describe durability of engineering materials   **[6 marks]**

QUESTION 3

a.   Operation of farm machinery can be noisy and hand signals are used for communication. Name the signals shown in Table 1.   **[10 marks]**

Table 1.   Hand signals used during noisy machinery

	HAND SIGNAL	MEANING
1		
2		
3		
4		
5		

b. Explain why these factors should be considered when choosing an irrigation system:

      i)   Quality of water

      ii)   Size of area to be irrigated

      iii)   Type of crop

      iv)   Type of soil

      v)   Value of crop being irrigated

[20 marks]

QUESTION 4

a. Write the four principles used as a guide to develop a waste management system.

[10 marks]

b. Discuss the four components of the waste management and their importance in a sustainable waste management system. **[12 marks]**

c. Discuss four human activities that contribute to global warming, that eventually leads to climate change. **[8 marks]**