



UNIVERSITY OF SWAZILAND
FINAL 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 TWO OTHER QUESTIONS

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CHIEF INVIGILATOR

QUESTION ONE: COMPALSORY QUESTION

- a) Describe with the aid of a diagram how the electromagnetic distance measurement (EDM) instruments operate. (5 marks)
- b) 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 9.5 seconds for the signal to be returned to the emitter, calculate the distance that was measured by the EDM. (5 marks)

- c) Discuss in detail how the surveyor's level was developed from a basic physics liquid principle to be what it is today. (7 marks)
- d) Give two examples of engineering materials that are among the following groups:
- Natural non metals; (4 marks)
 - Non ferrous metals; (4 marks)
 - Steel. (4 marks)
- e) What does the term 'Irrigation' mean? [4 marks]
- f) Give three general purposes where irrigation is applied. [6 marks]

Total /40**QUESTION TWO**


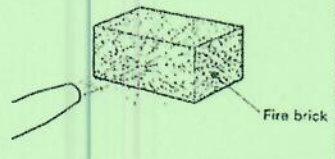
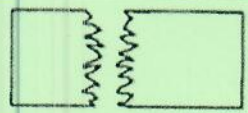
- a) What are the two categories of mechanics that are used in agricultural engineering? (4 marks)
- b) Which of these categories is used in agricultural structures to resolve forces and the ultimate design of buildings and structures? (2 mark)
- c) What roles do traffic signs play in the operation of moving farm machines? (9 marks)
- d) What is the purpose of having a pump unit as part of an irrigation system? (5 marks)
- e) Describe the waste management hierarchy and its importance in a sustainable waste management system. (10 marks)

Total/30

QUESTION THREE

- a) Table 1 shows a 50 cent coin with the Swazi emblem engraved on it and a snap rivet used to join two metals together. Name the properties the materials [6 marks]

Table 1. Some material that can be used in engineering

	Component	Property
1	 50 c coin	
2	 Fire brick	
3	 Wood	

- b) Distinguish between biodegradable and non-degradable waste, giving two examples for each. (10 marks)
- c) Give one advantage and one disadvantage for each of the following irrigation systems:
 - i. Sprinkler; (3 marks)
 - ii. drip irrigation. (3 marks)
- d) Discuss four common methods of drying grains. (8 marks)

Total/30

QUESTION FOUR

- (a) What are the three (3) equations of static equilibrium? (3 marks)
- (b) Calculate the magnitude of the forces R, and L in Figure 1. (9 marks)

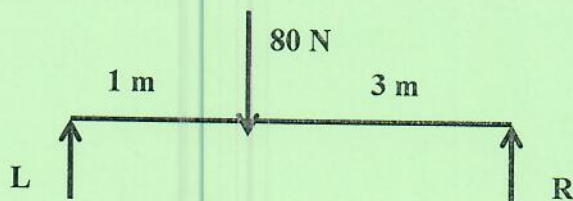


Figure 1. Concrete ring beam loading.

- c) Explain why drying grain is considered a loss to a farmer. (5 marks)
- d) State four reasons for processes agricultural produce. (5 marks)
- e) Discuss four signs of global warming (8 marks)

Total/30