



UNIVERSITY OF ESWATINI
RESIT EXAMINATION PAPER

PROGRAMME: BSC ABE II

COURSE CODE: ABE206/ ABE 209

BSc. ANIMAL SCIENCE (DAIRY) II

BSc. ANIMAL SCIENCE II

BSc. ANIMAL SCIENCE (DAIRY) IV

TITLE OF PAPER: FARM BUILDINGS AND STRUCTURES

TIME ALLOWED: TWO (2) HOURS

SPECIAL REQUIREMENT: A4 DRAWING PAPER

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO
OTHER QUESTIONS.

DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN
GRANTED BY THE CHIEF INVIGILATOR

SECTION I: COMPULSARY

QUESTION ONE

- A) What are the **five categories** of agricultural buildings and structures? (5 marks)
- B) A Farm manager intends to construct a **concrete silage silo** with a design life of 20 years. The depreciation cost is expected to be 5.0% per year and the initial costs were estimated to be E15, 000.00. The bank loan is currently at 15.0% interest and an insurance of 1.0 % after construction.
- Calculate the annual cost of the structure. (5 marks)
 - What would be the value of the structure after the second year of operation? (5 marks)
 - If the returns obtained from silage sales are E15, 000.00 annually, what advice would you give to the farm director and why? (5 marks)
- C) i. What are the **three (3) equations** of static equilibrium? (3 marks)
- ii. Calculate the **magnitude** of the forces R, and L in Figure 1 and M and N in Figure 2. (7 marks)

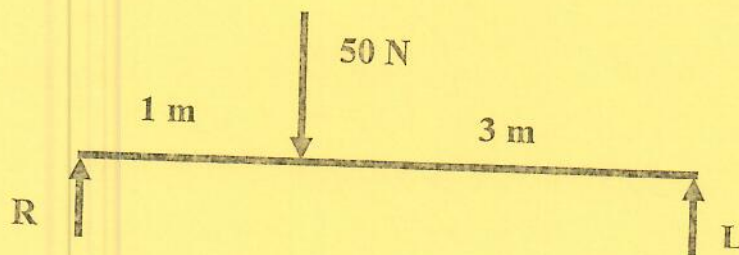


Figure 1. Concrete reinforced ring beam loading.

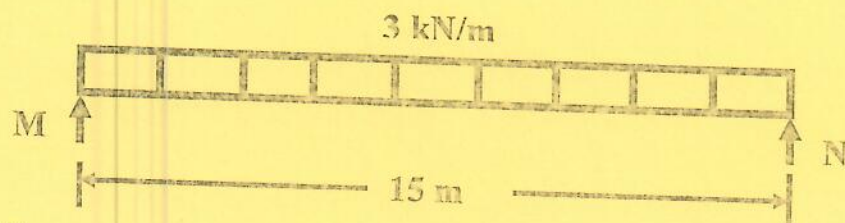


Figure 2. Concrete reinforced ring beam loading.

- D) i. Briefly describe the difference between **load bearing** and **non-load bearing** walls. (5 marks)
- ii. State the **two (2)** commonly used load bearing wall sizes in Swaziland, including the building material used for such walls? (4 marks)
- iii. State any **non-load bearing wall size** including the building material used for such wall sizes. (1 mark)
- [40 marks]

SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION TWO

- A. The concrete ring beam (2000 x 200 x 150) in Figure 3 failed resulting in structural damage to the building in question.

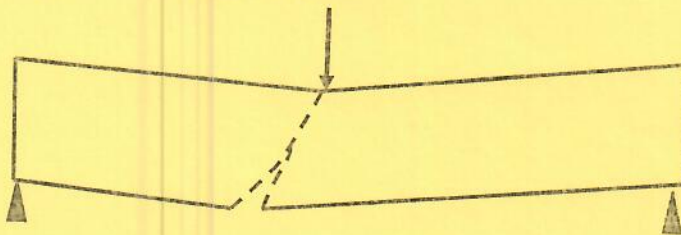


Figure 3. Concrete ring beam failure under load

- i. What was the structural problem that caused the ring beam to fail? (1 mark)
- ii. What could be done to **correct the failure** of the concrete ring beam? (2 marks)
- iii. Provide a design working **drawing or sketch** that would reflect a durable concrete beam, which could no fail under the circumstances in **Figure 1**. Your sketch should indicate the appropriate **dimensions** of the ring beam. (5 marks)
- B) An **axially loaded** concrete column had a uniformly distributed load of 1000 N and a resultant compressive stress of 33.33 N/m².
- i. Calculate the required footing area that would **adequately dissipate** the load of the column into the ground. (5 marks)
- ii. If the footing was designed to be **square in shape**, what were the dimensions i.e. **width and length** supposed to be? (4 marks)

- C) i. State the **two (2)** most common **categories** of **agricultural fences** giving at least one example of each? (2 marks)
- ii. What is the fence that could be recommended for the control of small ruminants i.e. sheep and goats in vegetable farms? (1 mark)
- iii. What type of **fencing posts** are **utilised** in the **construction** of this type of fence? (2 marks)
- iv. Briefly discuss the **functions** of fences in **agricultural production**. (8 marks)
- [30 marks]

QUESTION THREE

- A) Briefly discuss the **significance** of costing **agricultural buildings and structures** before design and construction. (6 marks)
- B) i. What are the structural elements other than roofs that make up agricultural buildings? (4 marks)
- ii. What are the **nine (9)** types of roof designs that re used in agricultural buildings and structures? (9 marks)
- iii. Which type of these roof designs is commonly used by **small holder farmers** in **Southern Africa**? (2 marks)
- iv. Why is the roof design stated above used the most by small holder farmers in Southern Africa? (2 marks)
- C) A 3000 x 2000 **concrete hydrant** protection was designed by an irrigation engineer to secure vandalism of her main water supply line. The hydrant protection was to be built using 6-inch concrete blocks that were 300 mm long, 150 mm wide and 150 mm high. If the foundation was 200 mm deep, with a standard mortar thickness of 15 mm between blocks, calculate the number of blocks that would be required for the valve protection. (13 marks)
- [30 marks]

QUESTION FOUR

- A) State the **three (3) types of loads** that can be exerted in agricultural buildings and structures giving at **least one example** of each. (6 marks)
- i. What are the **three** most common types of **stress** in agricultural buildings and structures? (6 marks)
- ii. A rivet of **10 mm** diameter is connecting two pieces of flat steel in a roof tie. **Calculate** the shear stress of the rivet when the steel bars are subjected to an axial pull of **6.0 kN**. (5 marks)
- iii. Why is **stress** calculation so important in the design of agricultural buildings and structures? (4 marks)
- B) i. What are the **main properties** of **structural sections** that have to be analysed during the **design of agricultural buildings and structures**? (6 marks)
- ii. Name the **three structural steel sections** that are used in the design and construction of agricultural buildings and structures (9 marks)

[30 marks]