

**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER**

PROGRAMMES: BSC ABE II

BSC ANIMAL SCIENCE (DAIRY) IV

COURSE CODE: ABE 209

TITLE OF PAPER: FARM BUILDINGS AND STRUCTURES

TIME ALLOWED: TWO (2) HOURS

**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO
OTHER QUESTIONS.**

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GRANTED BY THE CHIEF INVIGILATOR**

SECTION I: COMPULSORY

QUESTION ONE

- A) Name the **five** categories of agricultural buildings and structures giving at least one example of each? **(10 marks)**
- B) i. Briefly describe the difference between **load bearing** and **non load bearing** walls. **(5 marks)**
ii. Name the **two (2)** commonly used load bearing wall sizes in Swaziland, including the building material used for such walls. **(2 marks)**
iii. State any **non load bearing** wall size including the building material used for such wall sizes. **(2 marks)**
iv. Briefly describe how **load bearing walls** as well as the combination of **load bearing** and **non load bearing** wall material is utilised in the design of agricultural buildings and structures to achieve the desired wall sizes. **(5 marks)**
- C) A proposed **1000 ha** dairy farm was to be established following a feasibility study. The feasibility study indicated the following:
➤ Good returns if the farm could be transformed into a free range planted pasture dairy farm.
➤ Recommended partitioning or subdivision of the farm into grazing camps or paddocks for the **100 herd** jersey dairy cows.
i. Given that **1.0 ha** planted pasture = **2.0 livestock units**, calculate the adequate number of grazing camps suitable for this herd. **(5 marks)**
ii. What type of fence would you recommend for this type of animals and why would you recommend it? **(3 marks)**
- D) Discuss the economic importance of buildings and structures in agricultural production. **(8 marks)**
- [40 marks]**

SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION TWO

- A. The concrete ring beam (2000 x 200 x 150) in Figure 1 failed resulting in structural damage to the building in question.

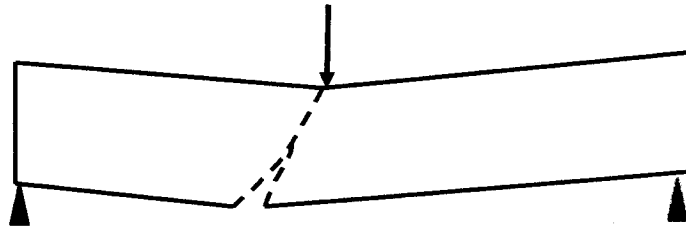


Figure 1. Concrete ring beam failure under load

- i. What was the structural problem that caused the ring beam to fail? (2 marks)
 - ii. What could be done to correct the failure of the concrete ring beam? (3 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. (10 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? (5 marks)
- C) Timber is one of the most common building materials used in a number of agricultural structures in Swaziland, but it has one major problem.
- i. State the structural weakness that timber has as a building material. (2 marks)
 - ii. How could such a problem be corrected in order to meet the design specifications of timber structural sections? (3 marks)

[30 marks]

QUESTION THREE

- A) Briefly discuss the **significance** of costing **agricultural buildings and structures** before design and construction. **(6 marks)**
- B) A Farm Director intends to construct a concrete silage silo with a design life expectancy of 20 years. The depreciation cost is expected to be 5 % per year and the initial costs were estimated to be **E5000.00**. The bank loan is currently at 17 % interest and an insurance of 1.0 % after construction. Calculate the annual cost of the structure. **(10 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. **(14 marks)**
[30 marks]

QUESTION FOUR

- A) i. What are the other **two (2)** structural elements that make up agricultural buildings other than the roof? **(4 marks)**
- ii. Name the **nine types** of roof designs in **Figure 2** that could be used in the design and construction of agricultural structures. **(9 marks)**
- iii. Which of these **roof designs** is commonly used by small holder farmers in Southern Africa? **(2 marks)**
- B) Discuss in detail the **six main factors** that affect the **choice** of building materials in agricultural buildings and structures. **(15 marks)**
[30 marks]

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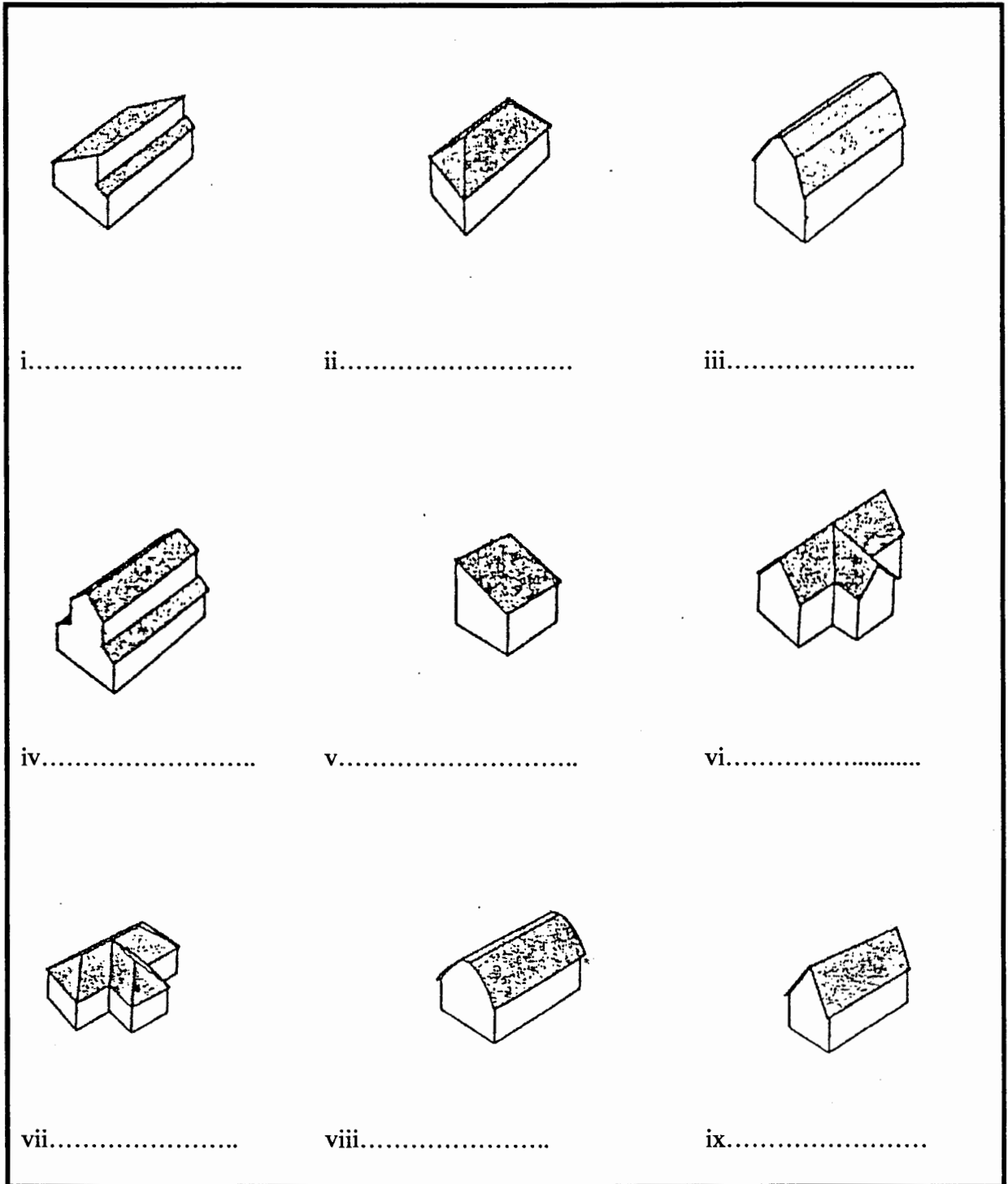


Figure 2. Types of roof designs