



**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) 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% per year and the initial costs were estimated to be E15, 000.00. The bank loan is currently at 15% interest and an insurance of 1. 5% after construction.
 - i. Calculate the annual cost of the structure. (7 marks)

 - ii. What would be the value of the structure after the second year of operation? (7 marks)

 - iii. If the returns obtained from silage sales are E15, 000.00 annually, what advice would you give to the farm director and why? (4 marks)

 - C) A small holder farmer was advised to protect his 3.0 ha vegetable field by fencing it. However, her challenge was how to restrain animals, particularly goats in view of the wide spectrum of agricultural fences available in the market.
 - i. What type of fence could be suitable for this vegetable production enterprise? (2 marks)

 - ii. If immediate posts would be spaced at 5.0 m spacing, how many would be required? (5 marks)

 - D) Discuss the economic importance of buildings and structures in agricultural production. (10 marks)
- [40 marks]**

SECTION B: ANSWER ANY TWO QUESTIONS**QUESTION TWO**

- A) i. What are the structural elements that makes up agricultural buildings other than the roof (4 marks)
- ii. Name any four of the nine types of roof designs that are used in buildings. (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)
- B) i. State the specific loads that roofs are designed to withstand. (3 marks)
- ii. Given that the wind speed experienced by a roof of a 3.2 m high hay barn was 25 m/s, compute the wind load using **equation 1** below. (5 marks)

$$q = 0.0127 V^2 k \quad (1) \quad \text{Where: } k = (h/6.1)^{2.7}$$

QUESTION THREE

- A) Define giving at least one example of the three main types of loads that can be exerted on farm buildings and structures. (6 marks)
- B) A concrete ring beam **150 mm x 150 mm** in cross section x **6.0 m** in length was designed to secure a maize storage sliding door in a poultry farm. Calculate the dead load of the beam, assuming gravity to be **9.81 m/s²** and the density of concrete as **5.0 kN/m³**. (4 marks)
- C) In not more that **ten lines**, state with the aid of a diagram the main weakness of concrete as a building material. (5 marks)
- D) Discuss in detail the **six main factors** that affect the **choice** of building materials. (15 marks)

[30 marks]

QUESTION FOUR

- A) A small holder farmer intends venturing into broilers raised on deep litter. He was advised to start small with 1000 birds.
- i. Translate this information into design specifications. (10 marks)
 - ii. Specify the dimensions i.e. **length** and **width** of the **ground plan** for this proposed farming enterprise given that the space requirement for broilers on deep litter is **6 birds/m²**. (5 marks)
- B) 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)
- C) i. What are the **two (2)** main types of stress that are experienced by structural members in farm buildings and structures? (4 marks)
- ii. A brick pier of **700 mm x 700 mm** and **3.0 m high** weighs **19 kN/m³**. It is supporting an axial load from a column of **490 kN**. The load is spread uniformly over the top of the pier. Calculate the stress in the brickwork immediately under the column. **Show all your work.** (6 marks)
- [30 marks]