UNIVERSITY OF SWAZILAND
FINAL 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

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

A) State the **five categories** of farm buildings and structures giving at least **one example of each.** **(5 marks)**

B) 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)**

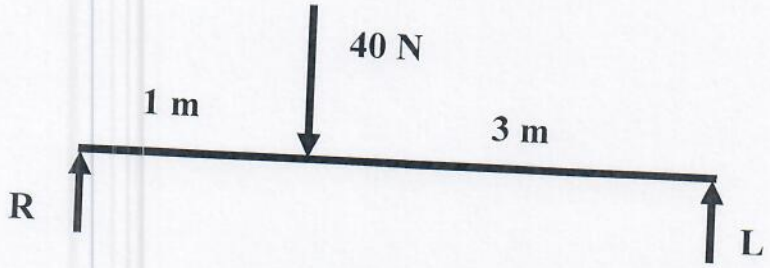

Figure 1. Concrete reinforced ring beam loading.

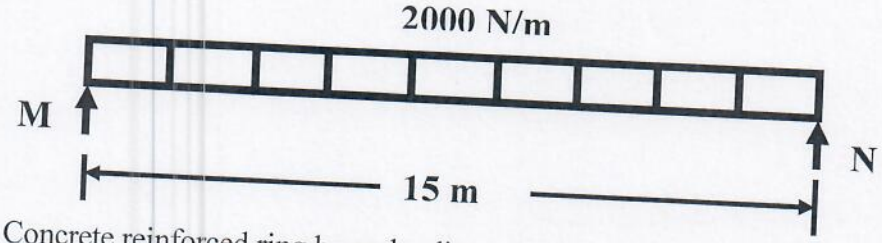

Figure 2. Concrete reinforced ring beam loading.

iii. What type of loading pattern is exerted in the beam in **Figure 1** and **Figure 2?**

C) i. What are the structural elements other than roofs that make up buildings? **(2 marks)**

ii. Name the **nine (9)** types of roof designs used in agricultural buildings and structures reflected in **Figure 3.** **(4 marks)**

iii. Which type of these roof designs is commonly used by **small holder farmers** in **Southern Africa**? **(9 marks)**

iv. Why is the roof design stated above used the most by small holder farmers in Southern Africa? **(2 marks)**

v. Which of these roof designs could be recommended for an **industrial manufacturing building?** Please state the **reason why** this roof design is recommended? **(6 marks)**

[40 marks]

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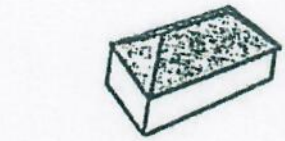
EXAMINATION N0.:.....



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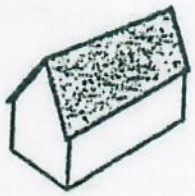

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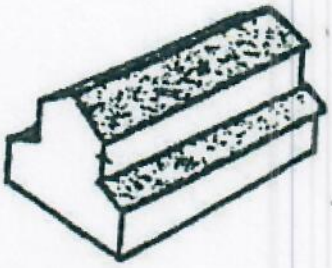

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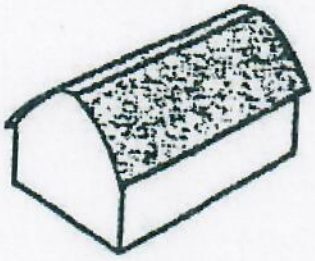

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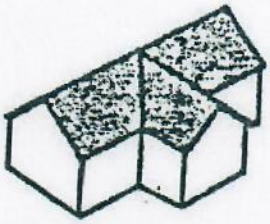

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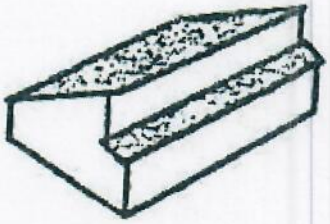

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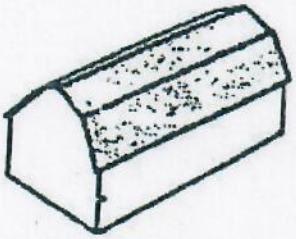

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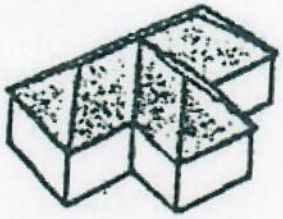

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Figure 3. Types of building roof designs **(9 marks)**

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SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION TWO

A) i. What are the **three (3)** most important components of concrete? **(3 marks)**

ii. Concrete components **ought** to be **well graded** when making concrete, discuss briefly what this statement means in relation to concrete strength. **(5 marks)**

iii. State the **weakness of concrete** as a building material and **explain** how this weakness could be **rectified** to improve the **weakness.** **(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. **(4 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. Explain what is meant by the mix **1:2: 3** in relation to the **three components of concrete**. **(1 mark)**

ii. Briefly discuss how the **workability of concrete** could be tested, clearly reflected its effect in the concrete **compression strength in question**. **(8 marks)**

[30 marks]

QUESTION THREE

A)

i. State the **three (3)** types of **loads** that could be exerted in **agricultural buildings and structures** giving at **least one example** of each. **(3 marks)**

ii. 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**. **(5 marks)**

B) **Timber** is one of the most common building materials used in a number of agricultural buildings and structures in Swaziland, but it has one **major problem**.

i. State the structural **weakness** that timber has as a building material. **(3 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 categories** of **agricultural fences?** **(2 marks)**

ii. Discuss any **three (3) major functions** of **fences** in **agricultural production.** **(7 marks)**

iii. Which type of **fence** could be **recommended** for restraining **small ruminants (sheep and goats)?** **(1 marks)**

D) An **agricultural fence** had a **perimeter of 849.00 m and the fencing posts were to be spaced at 5.00 m.**

i. Calculate **the number of posts** that would be required for the **fence.** **(3 marks)**

ii. Given that **each posts was E15.50, calculate** the cost of the posts. **(3 marks)**

[30 marks]

QUESTION FOUR

A) 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 **E95, 000.00**. The bank loan is currently at **15.0%** interest and an insurance of **1.0 %** after construction.

i. Calculate the annual cost of the structure. **(4 marks)**

ii. What would be the value of the structure after the second year of operation? **(4 marks)**

iii. If the projected returns obtained from silage sales are **E100, 000.00** annually, what advice would you give to the farm director and why? **(1 mark)**

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B) i. What is the **main reason** of costing agricultural buildings and structures? **(1 mark)**

ii. Calculate the annual cost of a multi-purpose storage for the second year if it was constructed through a bank loan of **E250, 000.00**. The bank **interest rate** is currently **9.5%,** with an **insurance of 2.5%, maintenance of 0.9%** and an **annual depreciation of 2.5%.**

(4 marks)

C) i. The **design** of **agricultural buildings and structures** requires that the designer should have design specifications. **Define specifications** as used in structural design.

(2 marks)

ii. **Discuss briefly** the **following attributes or** components which ought to be addressed by design specifications. **a)** Space requirement or capacity.

b) Load carrying capacities. **(6 marks)**

D) i. What are the **two (2) categories of walls** that could be used in the **construction of agricultural buildings?**

(2 marks)

ii. Describe the **difference** between the **two wall categories mentioned above (i)** giving an **example of the concrete block sizes** that are **possible for each wall category.**

(2 marks)

iii. State **and briefly describe** the **wall size combinations** that could be used during construction when using **concrete blocks** for each of the **concrete block wall categories identified.**

(4 marks)

[30 marks]