



**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.**

**SPECIAL REQUIREMENT: A4 DRAWING PAPER**

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GRANTED BY THE CHIEF INVIGILATOR**

**SECTION I: COMPULSORY****QUESTION ONE**

- A) Name the **five (5) categories** of agricultural buildings and structures giving at least one example of each? **(10 marks)**
- B) i. What are the other **two (2) structural elements** that constitute agricultural buildings other than **walls**? **(2 marks)**
- ii. Briefly describe the difference between **load bearing** and **non-load bearing** walls giving examples of the **concrete block wall sizes** that are possible for each category. **(5 marks)**
- iii. State the **construction combinations** that are used for each of the two (2) types of building walls stated above in ii. **(3 marks)**
- C) One of the **six main factors** that affect the **choice** of building materials in agricultural buildings and structures is transportation cost to the building site. Prove by calculation that the above statement is correct under the following conditions. A building construction company was building at a site **45 km** away from the nearest building material hardware.

<b>CONSTRUCTION SITE</b>		<b>HARDWARE (45 KM AWAY)</b>	
<b>Material</b>	<b>Cost (E)</b>	<b>Material</b>	<b>Cost (E)</b>
PP Cement (OPC)	80.80 per 50kg bag	Cement (OPC)	80.00 per 50kg bag
Concrete blocks	8.10 per block	Concrete blocks	8.00 per block
River sand	1000.00/ 5 ton truck	River sand	900/ 5 ton truck

- i. If the transport cost was **E7.20 / km**, calculate the benefit of using local material versus using material **source outside** the construction site. **Please state all your assumptions.** **(5 marks)**
- ii. State the other **five main factors** that affect the **choice** of building materials in agricultural buildings and structures other than **transport**. **(5 marks)**
- iii. Discuss in detail the **economic importance** of **agricultural buildings and structures** in **agricultural production**. **(10 marks)**
- [40 marks]**

**SECTION B: ANSWER ANY TWO QUESTIONS**

**QUESTION TWO**

- A) A small holder farmer intends venturing into broilers raised on deep litter. He was advised to start small with **1000 birds**.
- i. Which types and design of **structural elements** is the farmer supposed to use in order to save money? **(5 marks)**
  - ii. Calculate 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/m<sup>2</sup>**. **(5 marks)**
  - iii. Draw the **ground plan** for the proposed poultry house, showing the dimensions and the **title block** with all the information that it should have. **(10 marks)**
- B) i. What are the other **two** most common building materials other than **concrete**? **(3 marks)**
- ii. **Briefly**, discuss with the aid of a diagram the main **weakness** of **concrete** as a building material. **(7 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. **(6 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/s<sup>2</sup>** and the density of concrete as **5.0 kN/m<sup>3</sup>**. **(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 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/m<sup>3</sup>**. 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.** **(9 marks)**
- [30 marks]**

#### QUESTION FOUR

- A) i. What are the **three (3)** equations of **static equilibrium**? **(3 marks)**
- ii. Calculate the magnitude of the forces **R, L, M** and **N** in Figure 1. **(8 marks)**

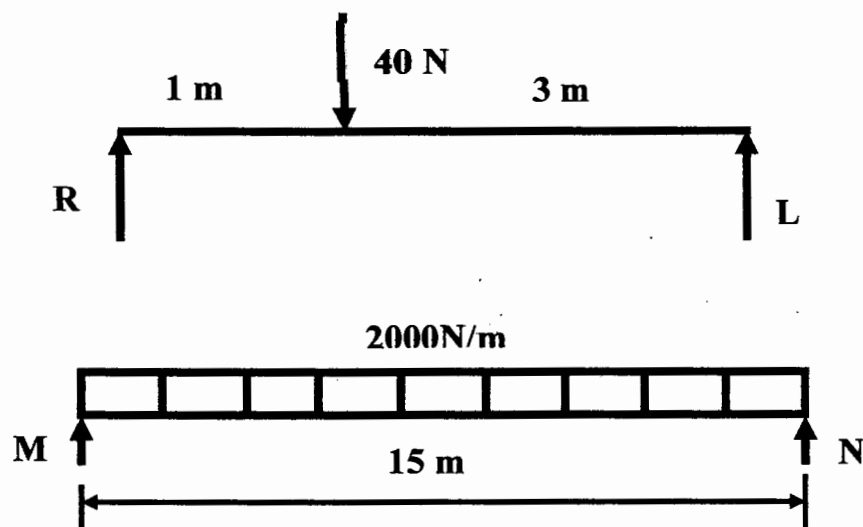


Figure 1. Loading patterns in concrete ring beams.

- iii. What type of **loading pattern** is exerted in each of the beams in **Figure 1**? **(2 marks)**
- B) i. What is the **main reason** of costing agricultural buildings and structures? **(2 marks)**
- 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%**. **(15 marks)**
- [30 marks]**