



## HIGHER EDUCATION PROGRAMMES

Academic Year 2024:	January - June
Formative Assessment 1:	Database Programming (HDBP200-1)
NQF Level, Credits:	6, 20
Weighting:	40%
Assessment Type:	Essay Questions
Educator:	Ralph Mavhunga
Examiner:	Luvuyo Ngcobo
Due Date:	28 March 2024
Total:	100 Marks

### Instructions:

- This paper consists of four (4) questions.
- It is based on Unit 1 to Unit 6 of the prescribed module textbook.
- All questions are compulsory.
- Submit your complete assessment as one (1) pdf document.
- A **Copyleaks Report** will be issued via ColCampus once the assignment is submitted. Please ensure that you follow the correct steps when uploading your assignment, to ensure that the Copyleaks Report is correctly issued. If the incorrect document is uploaded, or if no Copyleaks Report is issued, a mark of zero (0) will be awarded. If the Copyleaks Report indicates that a 30% similarity rating has been exceeded, 25% of the assessment total will be deducted from the final grade. Where a Copyleaks Cheat Detection Report is issued, your submission will automatically be treated as if you received a similarity rating in excess of 30% and 25% of the assessment total will be deducted from the final grade.

**Question 1****(30 marks)**

You are working for a small, family-owned retail business that sells a variety of products both in-store and online. The business has been growing steadily over the years, and they've reached a point where their existing data management system is becoming inadequate. They are experiencing difficulties in efficiently managing customer information, product inventory, sales data, and other aspects of their operations.

**Required:**

- 1.1 Explain the concept of database design and its importance in the context of the growing retail business. Provide specific examples of how a well-designed database can address the business's data management challenges. (10 marks)
- 1.2 Assess the advantages and disadvantages of managing a database system for the retail business. Consider aspects such as data integrity, security, and maintenance. Provide recommendations on how to mitigate potential disadvantages. (12 marks)
- 1.3 Explain the differences between data and information, and provide examples from the scenario to illustrate these concepts. How does proper database design contribute to transforming raw data into meaningful information for the retail business? (8 marks)

**Question 2****(25 marks)**

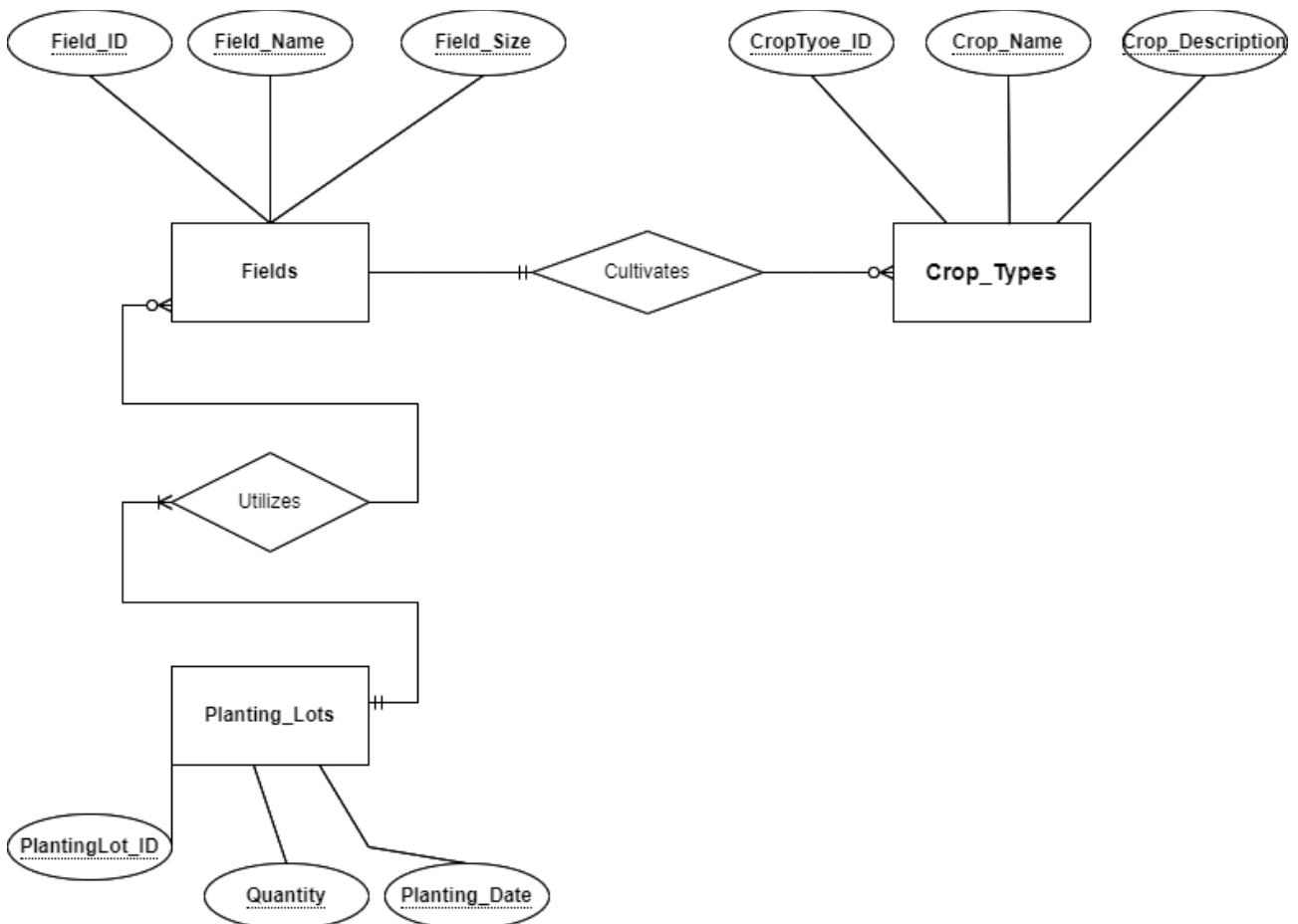
In the realm of modern agriculture, ensuring sustainable and efficient farming practices has become a paramount concern. To address this, a sophisticated Agricultural Management System (AMS) has been developed. The system's architecture is visually represented through an Entity-Relationship (ER) diagram that highlights key elements in the management of agricultural activities.

**Required:**

Convert the ER diagram into a relational database schema. In your answer, give the relations and indicate the primary keys, foreign keys, and any referential integrity constraints. (25 marks)

### Question 3

(20 marks)



Study the following schema carefully, then respond to the questions that follow.

Fields (Field\_ID, Field\_Name, Field\_Size)

Crop\_Types (CropType\_ID, Crop\_Name, Crop\_Description)

Planting\_Lots (PlantingLot\_ID, Quantity, Planting\_Date)

Fields[Field\_ID]  $\subseteq$  Crop\_types[CropType\_ID]

Fields[PlantingLot\_ID]  $\subseteq$  Planting\_Lots[PlantingLot\_ID]

**Notes:**

- In this schema, each time we want values to match across relations, the attributes have matching names.
- When the attributes have matching names, we want values to match across relations. This means that natural join will work perfectly well.

**Required:**

- 3.1 Referencing the schema above, state a relational algebraic expression that finds the names of all red parts. (4 marks)
- 3.3 What algebraic expression can be used to determine the Ids of all fields who utilizes the Red parts in the 'Fields' table and the 'Planting\_Lots' table?" (4 marks)
- 3.4 What are the names of all crops that provide a red or green part in their composition, considering the fields of "Fields" and "Crop\_Types"? (6 marks)

**Question 4**

**(25 marks)**

Consider a scenario where you have been hired as a database consultant for a company dealing with a large volume of customer data. Your task is to ensure the efficiency and integrity of their database design.

**Required:**

- 4.1 Conduct a critical evaluation of the process of collecting data that leads to the creation of unnormalized tables. Identify potential issues and discuss how normalization can address these issues, leading to a more efficient and reliable database design. (15 marks)
- 4.2 Analyze the potential issues with collecting and storing unnormalized data in a business setting. (4 marks)
- 4.3 Critically evaluate the benefits and drawbacks of normalizing previously unnormalized data, considering factors such as data integrity, query performance, and maintainability. (4 marks)
- 4.4 Provide a concise definition of normalization in the context of database design. (2 marks)