

1. (a) Describe **two** components of a *relational database*. (4 marks)
 - (b) With the aid of an example, distinguish between a *system privilege* and an *object privilege* as used in databases. (4 marks)
 - (c) Explain each of the following terms as used in data recovery in a database.
 - (i) checkpoint; (2 marks)
 - (ii) manual reprocessing; (2 marks)
 - (iii) immediate update. (2 marks)
 - (d) Peter would like to create a database system. Explain **three** stages in the database design development that the ER diagram would be most applicable. (6 marks)
2. (a) (i) Outline **two** *wild card characters* used in structured query language. (2 marks)
 - (ii) Explain a reason for using *If Exist* command in a structured query language. (2 marks)
 - (b) Distinguish between *active data dictionary* and *passive data dictionary* as used in databases. (4 marks)
It is there and being referenced
It is there and will later be referenced
 - (c) Describe each of the following components of three-tier database architecture.
 - (i) application tier; (2 marks)
 - (ii) presentation tier; (2 marks)
 - (iii) data tier. (2 marks)
 - (d) Figure 1 show s a filling approach that an educational institution uses to manage its applications. Use it to answer the question that follows. Explain **three** advantages that the institution will benefit from this approach (6 marks)

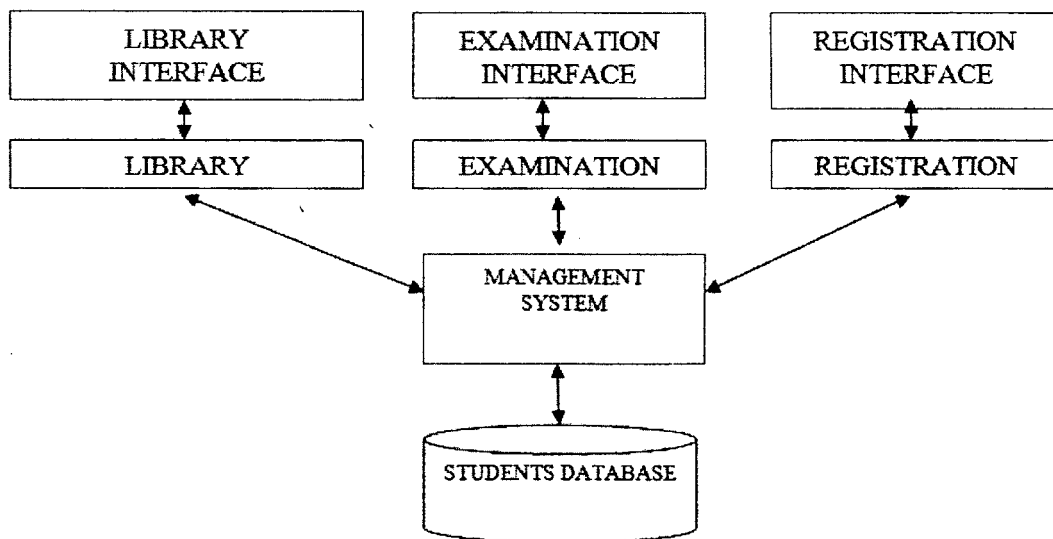
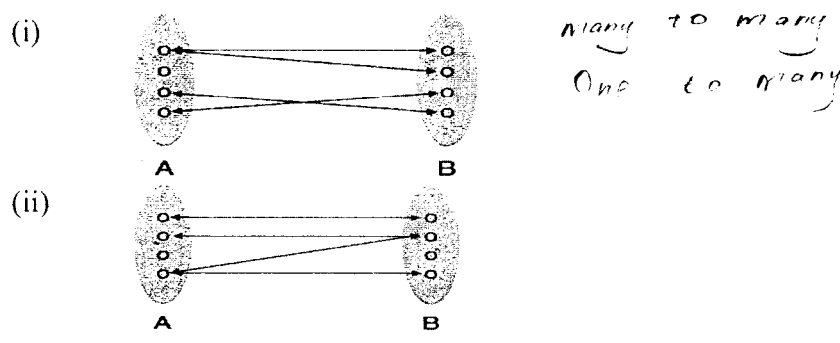


Figure 1

3. (a) Outline **four** factors to consider when developing a *user interface* for a database system. (4 marks)
- (b) Distinguish between a *database engine* and a *database schema* as used in database management system. (4 marks)
Database engine: Schema, structure
- (c) Martin would like to enforce security in a multiple user database environment using a data control commands. Describe **two** command statements that he is likely to use giving an example in each case. (6 marks)
- (d) An organisation intends to acquire a database application to manage its data. Describe **three** professional that may be required. (6 marks)
*Allow the user to create unique accounts
 SYSTEM Admin - install software
 Database Admin -
 Eat System security. Do not login, access system form*
4. (a) Outline **four** guidelines to consider when using *sub queries* in a structured query language. (4 marks)
- (b) Distinguish between *Embedded* and *Dynamic* structured query language. (4 marks)
- (c) Describe **two** levels of *data manipulation language* giving an example in each case (6 marks)
- (d) Write the equivalent of each of the following logical operations in relational calculus:
- (i) $P1 \wedge P2$ *Unique identification* (2 marks)
- (ii) $\forall t \in t(P(t))$ *Access table locate link* (2 marks)
- (iii) $P1 \Rightarrow P2$ (2 marks)
5. (a) A teacher noted that a database created by Andrew had data redundancy. Outline **three** problems that this may cause. (3 marks)
- (b) In an organisation, an employee is identified by a unique number, salary and telephone contact. Each employee works in a department. Each department is managed by an Employee and is identified by a department number, name and its budgetary allocation. Each employee may have a dependent child who is identified uniquely by employee's unique number, a name and age.
- (i) Draw an ER diagram to represent the narrative. (7 marks)
- (ii) Write a structured query language used to create **one** of the entities in the ER diagram in (i). (4 marks)
- (c) Describe **three** F. Armstrong's Axioms set of rules that generates functional dependencies as applied in normalisation of tables. (6 marks)
6. (a) State **two** similarities between a *hierarchical* and *network database* models. (4 marks)
- (b) Distinguish between *relational algebra* and *relational calculus* as used in database (4 marks)
- (c) Write a relational algebraic statement to perform each of the following:
- (i) Delete all loans with loan numbers between 1300 and 1500 from a deposit table. (2 marks)
- (ii) Increase all balances by 5 % in a deposit table. (2 marks)
- (iii) Display *empname, department* where salary is greater than 50,000 from the deposit table (2 marks)
Empname, department = salary > 50,000 (dept. #)

- (d) Explain **three** categories of anomalies that may be experienced when working with tables that are not normalised in a database. (6 marks)
7. (a) Outline **four** structured query language commands that may be used to enhance search capabilities in a database. (4 marks)
Find, Lock
- (b) Explain **two** reasons for one using online database.. (4 marks)
- (c) State **three** differences between a primary key and a foreign key as used in database. (6 marks)
*Primary key - Attributes are from the table.
Foreign key - use attributes from a different table.*
- (d) Outline **three** characteristics of each of the following distributed
 (i) Homogeneous. — *All PC at the same point* (3 marks)
 (ii) Heterogeneous — *storage at different points* (3 marks)
8. (a) Outline **four** characteristics of a well designed database. (4 marks)

(b) The following are cardinalities that can be used in an ER diagram for the entities A and B. Use it to answer the question that follows.



Describe each of the cardinalities represented in (i) and (ii). (4 marks)

- (c) Write tuple relational calculus statements for each of the following:
- (i) find the name of all employees in the employee table who work for the bank named Mini Bank; (2 marks)
- (ii) find all customers having both a loan and an account at the Kenyatta branch. (2 marks)
- (iii) display all fields from teaching (T) table where teaching code="K2000) (2 marks)
- (d) Table 1 shows details about students recorded in un-normalised table. Represent the following information to 2nd normal form. (6 marks)

Student	Age	Subject
Alice	25	ICT, Programming
Peter	24	Programming
Bob	27	Programming

Table 1

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