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)

(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)

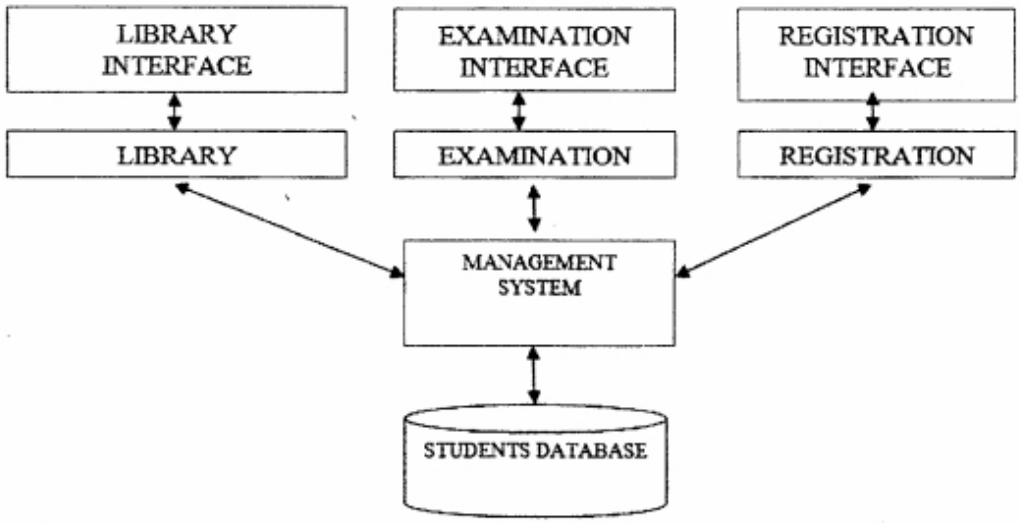

Figure 1

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)

(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)

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) $P1 \wedge P2$ (2 marks)

(ii) $\forall t \in t(P(t))$ (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 orgnisation, 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)

(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)

(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)

(d) Outline **three** characteristics of each of the following distributed

(i) Homogeneous. (3 marks)

(ii) Heterogeneous (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.

(i)

(ii)

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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