INSTRUCTIONS:

1. Answer **ALL** Questions in section ONE and any other 2 questions in section TWO
2. Time: Two hours.

Question #1 [30 Marks]
a) Consider the following relational database called "Company":
   Employee(Fname, Lname, EmpNo, Salary, DeptNo)
       Department(DeptName, DeptNo)
       Project(ProjName, ProjNo, Location, DeptNo)
       Works_on(EmpNo, ProjNo, Hours)

Specify the SQL statements that perform the tasks below:
   i) Create the four (4) tables clearly considering their relationships through key fields.
                                                                                    [8 Marks]
   ii) Retrieve the names of all employees showing their department names.   **[3 Marks]**
   iii) The Database Administrator accidentally executed an SQL statement that deleted all the entries in the EMPLOYEE table. What two SQL statement were possibly executed?**[2 Marks]**
   iv) An employee student with employee number '1001' had his lats name recorded as 'Omondi' instead of 'Omollo'. What SQL statement will effect the change?   **[2 Marks]**
   v) Find the average working hours for all employees.   **[2 Marks]**
   vi) Add a column called 'DOB' to the EMPLOYEE table with an appropriate data type to represent the employee's date of birth. Set it in such a manner that it cannot accept empty entries.   **[2 Marks]**
   vii) Create a view called EmployeeProject that brings together all the three tables over the key fields.   **[4 Marks]**
   viii) Query the view created in (vii) above to generate a list of employees whose salary is greater than 30,000 showing their names and project.   **[2 Marks]**
b) How has referential integrity been addressed in the relational database in (a) above?**[2 Marks]**
c) Outline the three key facilities provided by a DBMS.   **[3 Marks]**

Question #2 [20 Marks]
a) Discuss the three generations of DBMSs.   **[5 Marks]**
b) Consider the following un-normalized data:
   SalesOrderNo, Date, CustomerNo, CustomerName, CustomerAdd, ClerkNo, ClerkName, ItemNo, Description, Qty, UnitPrice
   With clear explanations, answer the following questions:
       i) Perform the 1NF.   **[5 Marks]**
       ii) Perform the 2NF.   **[5 Marks]**
       iii) Perform the 3NF.   **[5 Marks]**

Question #3 [20 Marks]

a) Name three record-based data models. Discuss the main differences between these data models **[5 Marks]**

b) Consider the following problem domain of an information system for a video rental store. Use it to answer the following questions.

Simplifying assumptions and details:
- It is a stand-alone store, not part of a larger organization.
- Rents only videos, not computer games or other items.
- A "video" can be in any medium: tape, DVD, and so on.
- The rental charge may vary by medium. For example, DVD rentals are more expensive than tapes.
- The store does not sell anything. For example, there are no sales of videos or food.
- All transactions are rentals.
- The input medium by which membership and video rentals are captured is not important.
- Cash-only payments.
- On completion of a rental, the customer receives a transaction report with 'typical' information.
- Each renter has a separate membership and can change the membership.
- Members can login to get book video.

i) Identify the entities involved with their respective attributes. **[6 marks]**

ii) Design and draw an ER diagram that captures all the information about the Information System for the video rental store. Use only the basic ER model; that is, entities, relationships, and attributes. Be sure to show the multiplicity. **[9 Marks]**

Question #4 [20 Marks]

Implementation of the Information System described in question 3 above takes into account the existing database security threats:

a) Discuss Discretionary Access Control and Mandatory Access Control. **[5 Marks]**

b) Discuss any three database security threats. **[6 Marks]**

c) Discuss any three Computer-based countermeasures to the database security threats. **[6 Marks]**

d) Assume you have a database with a table called EMPLOYEES. Write an SQL statement that will give UPDATE rights to a user with account name "john". **[3 Marks]**

Question #5 [20 Marks]

a) What is a view? State three benefits of views. **[4 Marks]**

b) With the aid of a well label diagram, discuss the two types of mapping with respect to the Three-Level ANSI-SPARC Architecture. **[10 Marks]**

c) State and explain the functions of any three components of a DBMS. **[6 Marks]**