1. (a) Outline **four** benefits that a college would achieve from using a database in maintaining students records. (4 marks)

(b) Distinguish between a *physical database designer* and *an application develop* as used in databases. (4 marks)

(c) Describe each of the following components of a database management system.

(i) query processor; (2 marks)

(ii) database manager control language interface; (2 marks)

(iii) recovery manager. (2 marks)

(d) The manager at Malimoto organization intends to incorporate client/server computing in their operations. Explain **three** benefits that the organization would achieve from this move. (6 marks)

2. (a) Distinguish between a *distributed database* and *distributed database management system.* (4 marks)

(b) Explain **three** goals of *requirement analysis phase* in a Database Design Life Cycle. (6 marks)

(c) Distinguish between *structured query language* and *relational algebra* as used in databases. (4 marks)

(d) Figure 1 shows an entity relationship diagram representing entity relationship in an organization. Use it to answer the questions that follow.

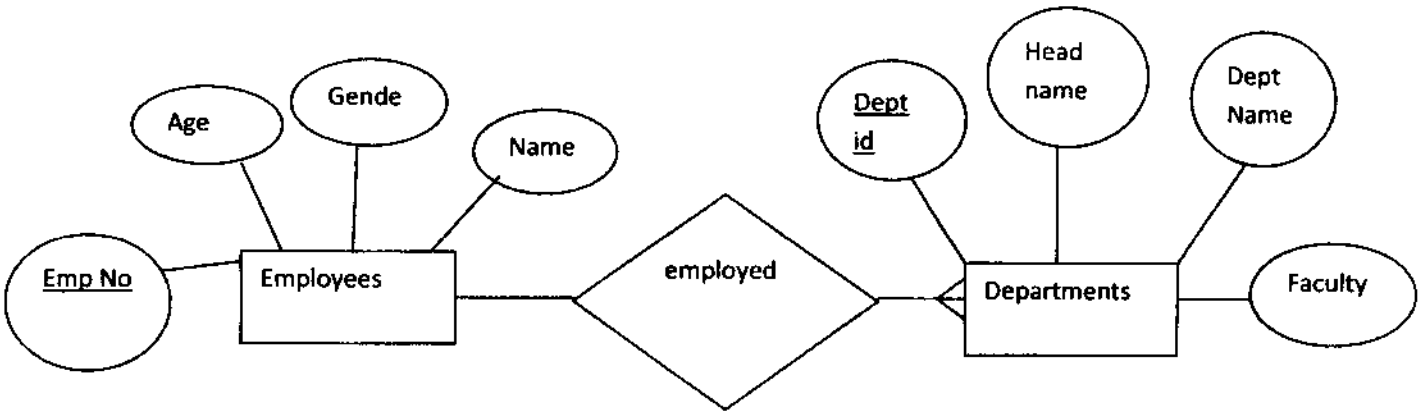

Figure 1

(i) Represent the diagram as a *relational schema.* (5 marks)

(ii) Identify a *relational set* in the figure. (1 mark)

3. (a) Outline **four** functions of an *alter* command as used in Structured Query Language. (4 marks)

(b) Distinguish between a *grant* and *a revoke* command as used in Structured Query Language. (4 marks)

(c) Amos an ICT student, created a database with redundant data. Explain **three** problems that the users of this database would experience. (6 marks)

(d) State **three** differences between *data administration* and *database administration.* (6 marks)

4. (a) (i) Define the term *view* as used in Structured Query Language. (2 marks)

(ii) State **three** characteristics of a *simple view* as used in Structured Query Language. (3 marks)

(b) With the aid of an example, describe a *spatial database.* (3 marks)

(c) State **two** differences between a u*nique constraint* and a *primary key constraint* as used in Structured Query Language. (4 marks)

(d) Table 1 shows a table named drivers in a database with details of drivers in a college. Use it to answer the questions that follow.

Driver id	Drivers name	Age	Salary
601	Mary	45	20,000
602	David	47	33,000
603	Mathew	32	45,000
604	Collins	44	22,000
605	Andrew	37	15,000

Table 1

Write an SQL statements that would be able to:

(i) define a table constraint that would ensure that every value in the salary field is greater than 14,000; (3 marks)

(ii) extract the two characters starting from the second character of the drivers name; (2 marks)

(iii) compute tax at a rate of 8% for those earning over 30,000 and display output in a field named tax; (3 marks)

5. (a) (i) Outline **four** factors to be considered when performing *first normal form* (INF) in databases. (4 marks)

(ii) Outline **two** characteristics of a table in a *third normal form* (3NF). (2 marks)

(b) Outline **five** factors that may lead to the failing of an inventory database during an operation. (5 marks)

(c) Figure 2 shows a dependency diagram for fields c1, c2, c3, c4 and c5.
Use it to answer the question that follows.

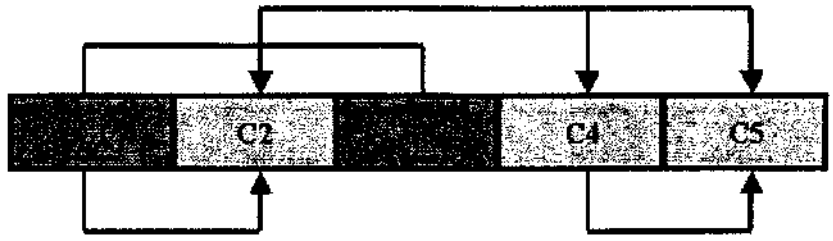

Figure 2

State, giving a reason, the types of dependencies used in the figure. (9 marks)

6. (a) Explain **three** factors that may lead an organisation to use an *object oriented database* approach. (6 marks)

(b) Explain **two** approaches used in database design. (4 marks)

(c) Figure 3 shows a database model. Use it to answer the questions that follow.

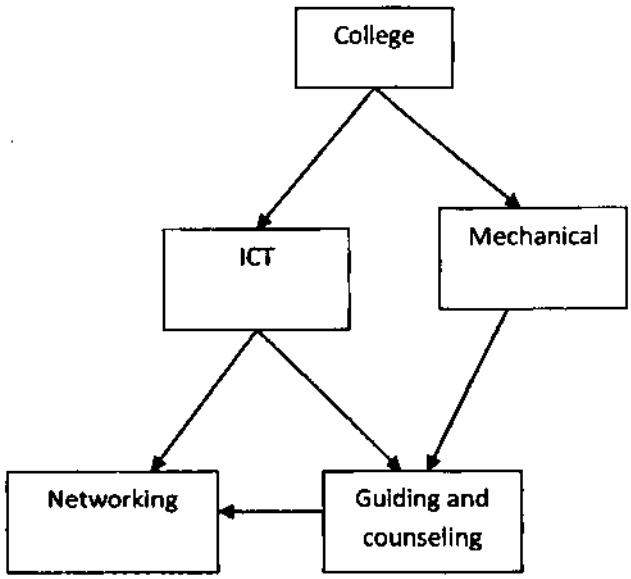

Figure 3

(i) Identify the type of model; (1 mark)

(ii) State **three** advantages of using the model identified in (i). (3 marks)

(d) With the aid of a labelled diagram in each case, outline the type of *cardinality* represented in each of the following statements.

(i) a manager can only manage a department. (2 marks)

(ii) several students make several applications to different universities. (2 marks)

(iii) a department has several employees. (2 marks)

7. (a) The following tables shows students information. Use them to answer the questions that follow.

stud id	name
1007	Christine
1008	Ali

Table 1

stud id	name
1008	Ali
1009	Tom

Table2

State the output when the following operations are applied between the tables.

(i) union; (2 marks)

(ii) intersection; (2 marks)

(iii) minus. (2 marks)

(b) Write equivalent SQL statements for each respective operation in (i). (6 marks)

(c) Describe **two** types of *quantifiers* that may be used in relational calculus expressions stating the symbol in each case. (4 marks)

(d) Given a relation named *staff*, write a relational algebra expression for the following statements.

(i) All the staff earn a salary of at least 9000; (2 marks)

(ii) There are less than 3 staff whose positions are managers. (2 marks)

8. (a) Describe each of the following queries as used in Structured Query Language.

(i) Make table action query; (2 marks)

(ii) Append action query. (2 marks)

(b) Given the following relations;

A	B
20	30
40	50

Tab1

B	C
50	60
70	8

Tab2

Perform each of the following in relational algebra:

(i) Tab1 ⋈ Tab2; (2 marks)

(ii) Tab 1 ⟕ Tab2; (2 marks)

(iii) Tab1 ⟖ Tab2; (2 marks)

(iv) Tab 1 ⟗ Tab2. (2 marks)

(c) Write the relational algebra statements for the following SQL statements;

(i)
```
select id, name
from table2
where hobby='swimming' or hobby='travelling';
```
(3 marks)

(ii)
```
select s1.name,s2.name
from students as s1,students as s2
where s1.telephone=s2.telephone
```
(3 marks)

(iii)
```
select  fname,lname
from customers
where balance <0
```
(2 marks)