

### Question 1 (Compulsory)

**(30 marks)**

- (a) Briefly describe the **three** components of the relational data model. [6]
- (b) Briefly describe **three** problems that can occur without data administration. [3]
- (c) Define the term *primary key*. [2]
- (d) What is an *entity*? What must be true for an entity to be a *weak entity*? [2]
- (e) Describe each of the following types of file organisation.
  - (i) Indexed file organisation. [2]
  - (ii) Hashed file organisation. [2]
- (f) Consider the following table structure.

Table Name: PRODUCT  
Product\_ID    NUMBER(4)  
Description   CHARACTER(20)  
Quantity      NUMBER(5)

  - (i) Write an SQL statement to create the PRODUCT table. [2]
  - (ii) Write an SQL statement to add the following new record to the PRODUCT table.  
  
Product\_id: 1001; description: HARD DISK; quantity: 100. [2]
  - (iii) Write an SQL statement to change the product description from hard disk to RAM chip for product id 1001. [3]
- (g) For each of the following relations, indicate, with justification, which normal form the relation is in.
  - (i) ORDER (OrderNO, Order\_date, Customer\_no, Customer\_name) [2]
  - (ii) PRODUCT (Product\_id, description, unit\_price) [2]
  - (iii) ORDER (OrderNO, Order\_date, Customer\_no, Customer\_name, product\_id, description, order\_quantity) [2]

*Please turn over*

## Question 2

- (a) Identify, with the aid of a diagram, the components of a database system. [9]
- (b) Briefly describe each of the following development stages and, for each, provide the output associated with that stage.
- (i) Planning.
  - (ii) Analysis.
  - (iii) Implementation. [6]

*Please turn over*

### Question 3

(a) List the **five** components of physical database design. [5]

(b) Normalize the following structure to 3NF. Be sure to detail what is carried out at each step of normalization (from UNF-3NF). Note that {} represents a repeating group.

STUDENT = (Student\_No, Name, Course\_no, Course\_name, {Subject\_ID,  
Subject\_title, exam\_mark, Exam\_date})

[10]

*Please turn over*

## Question 4

Consider the following tables.

EMPLOYEE

Empno	Emp_name	Deptno	Salary
1001	KING	10	3000
1002	JONES	20	1500
1003	SMITH	20	1200
1004	SAM	20	2000
1005	ADAMS	10	2000

DEPARTMENT

Deptno	Dept_name	Manager
10	SALES	1001
20	ACCOUNTING	1004

(a) Explain, via an SQL query and the above tables, *restriction*. [3]

(b) Explain, via an SQL query and the above tables, *projection*. [3]

(c) Show how the following view could be defined using SQL.

Emp\_dept view

Empno	Emp_name	Manager	Dept_name
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[3]

(d) Write an SQL query to display the average salary for each department number. [3]

(e) Write an SQL query to show the salaries of all employees whose name starts with the letter A. [3]

*Please turn over*

### Question 5

- (a) The relational and object-oriented models are two types of data model. Name **two** others. [2]

- (b) Consider the following scenario.

A company has a number of employees. The attributes of EMPLOYEE include NAME, ADDRESS, BIRTHDATE and HIREDATE. One method that is required of all employees is calYearsOfService. The company also has several projects. Attributes of PROJECT include CODE, DESCRIPTION and STARTDATE. Each employee may be assigned to one or more projects, or may not be assigned to a project. A project must have at least one employee assigned, and may have several employee assigned. One method required of all projects to Calctotcosttodate.

Draw an entity-relationship diagram for this scenario. [7]

- (c) Draw an object-oriented diagram for the scenario of part (b). [6]

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