Question 1 (Compulsory)

(a) Briefly describe the following terms in the context of databases:

(i) Information.

(ii) Database Management System (DBMS).

(iii) Database administrator.

(iv) User interface.

(v) Synonym. [5]

(b) Define the terms logical data independence and physical data independence. [2]

(c) List *five* factors that should be considered during the physical database design phase. [5]

(d) Define the terms database recovery and database security. [4]

(e) Briefly explain how the database approach resolves the following problems of traditional approach:

(i) Uncontrolled redundancy.

(ii) Limited data sharing.

(iii) Excessive program maintenance. [3]

(f) (i) Under what circumstances might a deadlock happen? Give an example of a deadlock situation. [3]

(ii) Briefly explain two ways of avoiding the problems brought about by deadlock. [4]

(g) (i) What is the goal of the three-schema architecture? [1]

(ii) Briefly explain the terms internal schema, conceptual schema, and external schema. [3]

Please turn over

Question 2

(a) Briefly explain the term *functional dependency*. [3]

(b) Define the refinement that takes place in each of the normalization steps.

(i) 1NF

(ii) 2NF

(iii) 3NF [3]

(c) Perform normalization based on the following initial design. ({} indicates a repeating group.)

PROJECT= (PROJECT_NUMBER, PROJECT_NAME, START_DATE, PROJECT_STATUS, {EMPLOYEE_NUMBER, EMPLOYEE_NAME, JOB_TITLE, DEPT_NUMBER, DEPT_NAME, PROJECT_HOURS})

[9]

Please turn over

Question 3

(a) ABC Publishing is a book publishing company that sells book to different types of customer, e.g., schools, colleges, individual customers, and so on. Many authors write more than one book for ABC Publishing, and some books are written by more than one author. Each author is identified by name and is associated with a publisher. ABC Publishing maintains an active list of over 100 books, each identified by a universal code called an ISBN number and an attribute called title. Draw an ERD for the ABC information systems. Clearly indicate the primary key and cardinality. [9]

(b) From the table below, identify

ORDER NUMBER	ORDER DATE	PRODUCT CODE	DESCRIPTION	QUANTITY ORDERED
40200	01-MAR-03	A10	RAM CHIP	5
40200	01-MAR-03	A20	HARD DISK	10
40200	01-MAR-03	A30	SDRAM	13
40201	01-MAR-03	A10	RAM CHIP	50
40202	03-MAR-03	A30	SDRAM	10
40202	03-MAR-03	A40	PC CARD	50
40203	03-MAR-03	A30	SDRAM	13
40203	03-MAR-03	A40	PC CARD	50
40204	04-MAR-03	A20	HARD DISK	5
40204	04-MAR-03	A30	SDRAM	50

(i) A primary key [1]

(ii) A composite key [1]

(iii) TWO probable foreign key [2]

(iv) Any TWO non key attribute [2]

Question 4

(a) You are the data administrator for a particular organization. For each of the following stages for developing a database identify the associated deliverable.

(i) Planning.

(ii) Analysis.

(iii) Logical database design.

(iv) Physical database design.

(v) Implementation. [5]

(b) For each of the items that follow, identify the type of security scheme it belongs to, and, for each, give a brief definition of that type. [10]

(i) Using finger print recognition

(ii) Has to provide password (for window) when logging into Personal Computer

(iii) Purchase items from supermarket by using Credit Card

(iv) The user has to provide a password when logging on to the database server

(v) The database administrator creates a *view* to allows user to retrieve their own salary, but not those for the entire organization

Question 5

Consider the following tables:

SUBJECT

SUBJECT_ID	**TITLE**
CS211	SYSTEM ANALYSIS AND DESIGN
CS212	COMPUTER ARCHITECTURE
CS213	SOFTWARE ENGINEERING
CS215	ADVANCE C
CS216	INTRODUCTION TO SQL AND PL/SQL

STUDENT

STUDENT_ID	**NAME**	**CONTACT_NO**
20200	ADAM KING	1234567
20303	ANITA	2222222
20304	WILSON CHEW	7777777
20306	CHEONG AI LING	8989898
20307	ABDULLAH ALI	6565655
20308	MILIKODI	4343434

ENROLMENT

STUDENT_ID	**SUBJECT_ID**	**STATUS**	**MARK**
20202	CS211	REUNIT	50
20202	CS213	REUNIT	80
20303	CS211	FRESH	22
20303	CS212	FRESH	40
20304	CS213	REFER	78
20307	CS215	FRESH	33
20308	CS215	REFER	56

(a) Write an SQL statement to display the average marks for individual subject ids. [3]

(b) Write an SQL statement involving a subquery to display those subjects that do not appear in ENROLMENT. [4]

(c) Display the output that would be produced by the following SQL statement. [2]

```
SELECT SUBJECT_ID, MARK
FROM ENROLMENT
ORDER BY SUBJECT_ID, MARK DESC;
```

Question 5 continues on the following page.
Please turn over

(d) Write an SQL statement to display individual student ID, name, subject number, title, and mark they scored for each subject. [4]

(e) Write an SQL statement to display students whose names begin with the letter A. [2]

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