

INFORMATION AND COMMUNICATION TECHNOLOGY

PAPER 2A

Databases

Question-Answer Book

11.15 am – 12.45 pm (1 hour 30 minutes)

This paper must be answered in English

INSTRUCTIONS

- (1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3 and 5.
- (2) **ANSWER ALL QUESTIONS.** Write your answers in the spaces provided in this Question-Answer book. Do not write in the margins. Answers written in the margins will not be marked.
- (3) Supplementary answer sheets will be supplied on request. Write your candidate number, mark the question number box and stick a barcode label on each sheet, and fasten them with string **INSIDE** this book.
- (4) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.
- (5) The last page of this Question-Answer book contains SQL commands and symbols used in entity-relationship diagrams which you may find useful.

Please stick the barcode label here.

Candidate Number

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Answer all questions.

1. An athletic club is organising a running competition. Three database tables PAR, EVE and RES are used to store information relating to the competition.

PAR

Field name	Description	Example
PID	Identity code of the participant	F0023
PNAME	Name in English	Susan Li
GENDER	Gender of the participant (F – female; M – male)	F
AGE	Age	18

EVE

Field name	Description	Example
EID	Identity code of the event	E08
DIS	Race distance in metres	1500
GENDER	Gender of the participant (F – female; M – male)	F
MAXA	Maximum age of the participant	24
MINA	Minimum age of the participant	16
QUOTA	The quota for the event	30

RES

Field name	Description	Example
PID	Identity code of the participant	F0023
EID	Identity code of the event	E08
TIME	Result in seconds	301.50

Write SQL commands to complete the following tasks from (a) to (d).

- (a) The identity code for Susan is 'F0023'. List the race distances of the events that Susan has completed.

(3 marks)

- (b) The age limits of events are stored in MAXA and MINA of EVE. A female participant is 20 years old. List the race distances of the events that this female participant can take part in.

(3 marks)

Answers written in the margins will not be marked.

- (c) Give the maximum number of female participants in the competition.

(3 marks)

- (d) For some race distances, the athletic club does not arrange events for female participants to take part in. List the race distances of these events and the corresponding numbers of events.

(3 marks)

- (e) What is the purpose of the following SQL command?

```
SELECT DISTINCT P1.PNAME
FROM RES R1, PAR P1
WHERE R1.PID = P1.PID AND
      EXISTS
        (SELECT R2.EID
         FROM RES R2
         WHERE R1.EID = R2.EID
         GROUP BY R2.EID
         HAVING R1.TIME = MIN(R2.TIME))
```

(2 marks)

Answers written in the margins will not be marked.

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2. Mr Lee develops an online shopping system for a company so that members can buy its products online. He designs the following database tables for the system.

MEM

Field name	Description
MID	Identity code of the member
MNAME	Member name

PROD

Field name	Description
PID	Identity code of the product
PNAME	Product name
UPRICE	Unit price
WID1	Identity code of Warehouse 1
ADDR1	Address of Warehouse 1
WNAME1	Name of Warehouse 1
STOCK1	Number of the products in the Warehouse 1
WID2	Identity code of Warehouse 2
ADDR2	Address of Warehouse 2
WNAME2	Name of Warehouse 2
STOCK2	Number of the products in the Warehouse 2

TRAN

Field name	Description
TID	Identity code of the transaction
MID	Identity code of the member
PID	Identity code of the product
QUAN	Quantity of the product purchased
PDATE	Date and time of the transaction

- (a) Mr Lee creates TRAN by using the following SQL command.

```
CREATE TABLE TRAN (  
    TID char(10) not null,  
    MID char(10) not null,  
    PID char(10) not null,  
    QUAN int not null,  
    PDATE date not null )
```

- (i) What is the meaning of 'not null' in the command?

- (ii) Other than 'not null', give another type of constraint that can be added to the command.

(2 marks)

Please stick the barcode label here.

(b) Draft an ER diagram for the database design. It is not necessary to draw attributes in the diagram.

(4 marks)

(c) (i) Mr Lee creates a view `FIND_VIP` to find members who have transactions in which the total spending is greater than \$10,000. Complete `FIND_VIP` below.

`CREATE VIEW FIND_VIP AS`

`SELECT` \_\_\_\_\_

`FROM` \_\_\_\_\_

`WHERE` \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(ii) Mr Lee creates views for data extraction. Give **two** benefits of using views.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(5 marks)

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(d) The company has several warehouses. Each product will be stored in no more than two warehouses.

(i) Give **two** issues with storing product data in PROD.

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(ii) Mr Lee uses three database tables PRODUCT, WAREHOUSE and STOCK to replace PROD so as to solve the issues in (d)(i). Complete the database schema of the three tables below and give the description of new field names.

PRODUCT ( \_\_\_\_\_ )

Primary key: \_\_\_\_\_

WAREHOUSE ( \_\_\_\_\_ )

Primary key: \_\_\_\_\_

STOCK ( \_\_\_\_\_ )

Primary key: \_\_\_\_\_

Description of the new field names:

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(6 marks)

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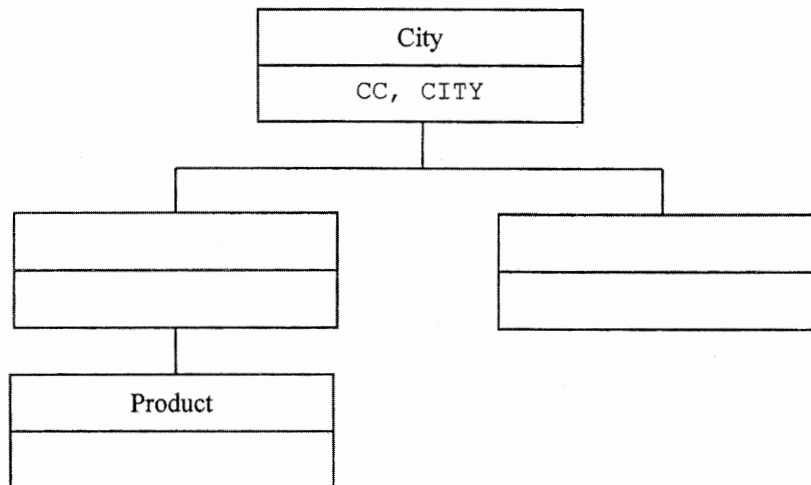
Answers written in the margins will not be marked.

3. ABC company has many supermarkets in Asia. In the 1980s, ABC company computerised its business operations by introducing a database management system (DBMS).

(a) The DBMS adopted a hierarchical model for storing the following information.

Field name	Description
BID	Branch code
BNAME	Branch name
CC	City code
CITY	City name
CID	Identity code of the customer
CNAME	Customer name
PID	Identity code of the product
PNAME	Product name

Complete the logical data representation of the hierarchical model below.



(3 marks)

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ABC company revamps the DBMS to keep up with operational needs. It uses the following database tables CUST, PROD and TRAN to store information on customers, products and transactions respectively.

CUST

Field name	Description
CID	Identity code of the customer
CNAME	Customer name
BAL	Account balance

PROD

Field name	Description
PID	Identity code of the product
PNAME	Product name
SPRICE	Selling price

TRAN

Field name	Description
TID	Identity code of the transaction
CID	Identity code of the customer
PID	Identity code of the product
QUAN	Quantity of the product purchased

- (b) Identify the primary keys and foreign keys for PROD and TRAN if any.

	Primary key	Foreign key
PROD		
TRAN		

(3 marks)

- (c) ABC company pays a lot of money annually for the use of the DBMS. Although free hierarchical DBMS is available, it decides to keep using the current commercial relational DBMS. Give **four** reasons to support this decision.

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(4 marks)

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(d) (i) Indexing can improve query performance. What is the drawback of using an index?

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(ii) In the table CUST, an index on CID is created.

(1) The performance of the following SQL command does not improve much with the index. Why not?

```
SELECT SUM(BAL) FROM CUST
```

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(2) Give a SQL command that uses the index to improve the query performance.

(4 marks)

Answers written in the margins will not be marked.

4. Mr Ng is a project manager in an IT company. He plans to develop a mobile application about air quality. He collects and stores the Air Quality Health Index (AQHI) readings in 2014, as shown below.

Date & time District	0:00 1.1.2014	1:00 1.1.2014	...	14:00 5.1.2014	...	23:00 31.12.2014
Central	3	3		5		3
Kwun Tong	3	3		4		3
Tap Mun	1	1		3		2
...						

Mr Ng uses Computer Aided Software Engineering (CASE) tools to develop the mobile application.

- (a) (i) For each of the following CASE tools, give a major deliverable that Mr Ng will produce.

CASE tool	Deliverable
Query editor	
Graphical modelling tool	
Project management tool	

- (ii) Mr Ng wants to set up a central repository that contains information for the CASE tools to use. Give **two** examples of the information.

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(5 marks)

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(b) Mr Ng will go through the following eight stages in the development life cycle.

- (1) Requirements collection and analysis
- (2) System definition
- (3) Application and database design
- (4) Prototyping
- (5) Data migration
- (6) Form and report design
- (7) Testing
- (8) Operational maintenance

Mr Ng will perform the following tasks. Match the appropriate stage with each task.

- (i) Find any program bugs before launching the application. \_\_\_\_\_
- (ii) Draw ER diagrams. \_\_\_\_\_
- (iii) Launch a bug-fix version of the application. \_\_\_\_\_
- (iv) Develop a trial version for demonstration. \_\_\_\_\_
- (v) Ask users about their needs. \_\_\_\_\_

(5 marks)

(c) (i) Give one example of the summary information that Mr Ng can generate from the data of the 2014 AQHI.

(ii) Mr Ng applies data mining technology to discover some patterns in the data. Give **two** examples of the different kinds of patterns, such as trends in the AQHI.

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(3 marks)

(d) The IT company requires Mr Ng to observe ethical practices when developing this mobile application. Give **two** examples of the ethical practices.

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(2 marks)

**END OF PAPER**