UNIVERSITI SAINS MALAYSIA

First Semester Examination
[Peperiksaan Semester Pertama]

Academic Session 2008/2009
[Sidang Akademik 2008/2009]

November 2008

CMT221 – Database Organisation & Design
[Organisasi & Reka Bentuk Pangkalan Data]

Duration : 2 hours
[Masa : 2 jam]

INSTRUCTIONS TO CANDIDATE:

- Please ensure that this examination paper contains **FOUR** questions in **NINE** printed pages before you begin the examination.

  *[Sila pastikan bahawa kertas peperiksaan ini mengandungi **EMPAT** soalan di dalam **SEMBILAN** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]*

- Answer **ALL** questions. Please write your answers according to the sequence of the questions.

  *[Jawab **SEMUA** soalan. Sila tulis jawapan anda mengikut turutan soalan]*

- You may answer the questions either in English or in Bahasa Malaysia.

  [Anda dibenarkan menjawab soalan sama ada dalam Bahasa Inggeris atau Bahasa Malaysia.]

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1. (a) A small publisher requires a database to be designed to record Publications ordered by Customers.

A Customer is identified by Custno and a Publication by Pubno. Customer data includes Name, and Address.

All Publication data includes the attributes Title, Price and Date. You are further told that a Publication can be a Book or a Magazine. Magazines also have an attribute DeliveryCost whereas Books have an attribute Author.

A customer may subscribe to many Magazines, whereas a Magazine may be subscribed to by many customers. The start-date of the subscription has also to be recorded. A customer may order many Books, whereas a Book may be ordered by many customers. The date of the order is also recorded.

Draw the E-R diagram (you can use Chen model, Crow's foot model or UML class diagram) showing all entities and relationships, including participation conditions. Show all your work including how you resolve any many-to-many relationships. Underline the primary keys and mark foreign keys with (FK).

(15/100)

(b) There are three types of keys, namely candidate, secondary and primary keys. Define each and indicate the link, if any, between them.

(5/100)

(c) Explain the differences between conceptual, internal and physical models.

(5/100)

2. (a) The following relations are part of a relational database:

Resort (**ResortID**, ResortName, Address)
Hotel **(HotelID, ResortID**, HotelName, Rating, Price)
Customer **(CustomerID**, CustomerName, Address)
Reservation **(ResortID, CustomerID, FromDate**, ToDate, HotelID)

The primary key in each table is shown by underlining.

Write expressions **in SQL** to retrieve or update each of the following:

(i) The names and addresses of all customers who have reservations at the Gurney Hotel, which has a HotelID of GURNEY.

(5/100)

(ii) Cancellation of the reservation of customer whose CustomerID is 93115.

(4/100)

(iii) A count of the hotels in Pulau Redang resort.

(4/100)

(b) Define the concepts of entity integrity and referential integrity. Illustrate your definitions using an example database schema having a STUDENT relation schema and a DEPARTMENT relation schema.

(6 /100)

(c) What is time-variant data, and how would you deal with such data from a database design point of view?

(6/100)

3. (a) What is a partial dependency? What normal form does it associate with?

(4/100)

(b) Based on the INVOICE table structure which consists of 5 records shown below:

INV_NUM	PROD_NUM	SALE_DATE	PROD_LABEL	VEND_CODE	VEND_NAME	NUM_SOLD	PROD_PRICE
211347	AA-E3422Q	1-Aug-2008	PUNCHER	300	ABC Trading	2	5.50
211347	QD-300932X	1-Aug-2008	PAPER CLIP	300	ABC Trading	4	3.20
211348	AA-E3422Q	1-Aug-2008	PUNCHER	300	ABC Trading	3	5.50
211348	GJ-778345P	2-Aug-2008	STAPLER	400	BJ Trading	5	3.30
211349	GJ-778345P	2-Aug-2008	CUTTER	350	Pena Trading	4	2.50

(i) Write the relational schema.

(3/100)

(ii) Draw its dependency diagram. Identify all dependencies, including partial and transitive dependencies.

You may assume that the table does not contain repeating groups and an invoice number references more than one product. (Hint: this table uses a composite primary key.)

(9/100)

(iii) Describe and illustrate the process of normalizing the table above to Second (2NF), and Third (3NF) Normal Form.

(7/100)

4. (a) Consider the following two tables:

TABLE T1

P	Q	R
10	a	5
15	b	8
25	a	6

TABLE T2

A	B	C
10	b	6
25	c	3
10	b	5

Show the results of the following operations:

(i) T1 Inner Join T2 where T1.Q < T2.B. (The inequality is based on character comparison; show both Q and B in the result.)

(ii) T1 Right Outer Join T2 where T1.Q = T2.B.

(iii) T1 Inner Join T2 where T1.P = T2.A and T1.R = T2.C.

(10/100)

(b) Given the following relational tables:

Merchandise (ItemID, Description, Category, ListPrice, QuantityOnHand)
Order (PONumber, OrderDate, ReceiveDate, SID, EmpID, ShipCost)
OrderItem (PONumber, ItemID, Quantity, Cost)
Sale (SaleID, Date, CustomerID, EmployeeID)

Which merchandise items with more than 400 on hand quantity have not been ordered? You may answer using either Outer Join or sub-query.

(6/100)

(c) Explain the difference between a distributed database and a distributed processing.

(5/100)

(d) For years, security experts have been concerned about theft and fraud by people who work for the company. One of the methods to prevent these from happening is to have division of duties among the workers.

(i) How does a good DBMS application provide the support to this control?

(ii) Give **one (1)** example to support your reason.

(6/100)

1. (a) Sebuah syarikat penerbitan kecil memerlukan satu pangkalan data yang direka bentuk untuk mencatat Penerbitan yang dipesan oleh Pelanggan.

Seseorang Pelanggan dikenal pasti oleh Custno dan sesebuah Penerbitan dikenal pasti oleh Pubno. Maklumat Pelanggan termasuk Nama dan Alamat.

Semua maklumat Penerbitan termasuk atribut-atribut Tajuk, Harga dan Tarikh. Anda juga diberitahu bahawa sebuah penerbitan boleh sebagai Buku atau Majalah. Majalah juga mempunyai atribut KosPenghantaran manakala Buku mempunyai atribut Pengarang.

Seseorang pelanggan boleh memesan banyak Majalah, manakala sebuah Majalah boleh dipesan oleh ramai pelanggan. Tarikh-mula bagi bayaran untuk langganan mesti dicatat. Seseorang pelanggan boleh memesan banyak Buku, manakala sebuah Buku boleh dipesan oleh ramai pelanggan. Tarikh pesanan juga dicatat.

Lukiskan satu gambar rajah E-R (anda boleh guna model Chen, model Crow's Foot atau gambar rajah kelas UML) untuk menunjukkan semua entiti dan perhubungan, termasuk syarat-syarat penyertaan. Tunjukkan semua langkah anda termasuk bagaimana anda menyelesaikan perhubungan banyak-ke-banyak. Gariskan kunci utama dan tandakan kunci asing dengan (FK).

(15/100)

(b) Terdapat tiga jenis kunci, iaitu kunci calon, sekunder dan utama. Takrifkan setiap kunci dan tunjukkan hubungan antara mereka jika ada.

(5/100)

(c) Terangkan perbezaan antara model konsepsi, model dalaman dan model fizikal.

(5/100)

2. (a) Hubungan-hubungan berikut adalah sebahagian daripada pangkalan data perhubungan:

Resort (**ResortID**, ResortName, Address)

Hotel **(HotelID, ResortID**, HotelName, Rating, Price)

Customer **(CustomerID**, CustomerName, Address)

Reservation **(ResortID, CustomerID, FromDate**, ToDate, HotelID)

Kunci utama di dalam setiap jadual telah digariskan.

Tuliskan kenyatan-kenyataan dalam **SQL** untuk mengambil balik atau mengemaskini setiap yang berikut:

(i) Nama-nama dan alamat-alamat bagi semua pelanggan yang sudah menempah di Hotel Gurney dan HotelIDnya ialah GURNEY.

(5/100)

(ii) Pembatalan tempahan pelanggan yang CustomerIDnya ialah 93115.

(4/100)

(iii) Pengiraan bilangan hotel di dalam tempat peranginan Pulau Redang.

(4/100)

(b) Takrifkan konsep-konsep kewibawaan entiti dan kewibawaan rujukan. Jelaskan takrif-takrif anda melalui skema pangkalan data contoh yang mempunyai satu skema hubungan STUDENT dan satu skema hubungan DEPARTMENT.

(6/100)

(c) Apakah data perubahan-masa, dan bagaimana anda menangani data tersebut dari segi reka bentuk pangkalan data?

(6/100)

3. (a) Apakah kebersandaran separa? Pernormalan bentuk ke berapakah ianya dikaitkan?

(4/100)

(b) Berdasarkan struktur jadual INVOICE yang mengandungi 5 rekod di bawah:

INV_NUM	PROD_NUM	SALE_DATE	PROD_LABEL	VEND_CODE	VEND_NAME	NUM_SOLD	PROD_PRICE
211347	AA-E3422Q	1-Aug-2008	PUNCHER	300	ABC Trading	2	5.50
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211349	GJ-778345P	2-Aug-2008	CUTTER	350	Pena Trading	4	2.50

(i) Tuliskan skema hubungan.

(3/100)

(ii) Lakarkan gambar rajah kebersandaran tersebut. Kenal pasti semua kebersandaran, termasuk kebersandaran separa dan transitif.

Anda boleh menganggap jadual tersebut tidak mengandungi kumpulan berulang dan nombor invois merujuk lebih daripada satu produk. (Petunjuk: jadual ini menggunakan kunci utama komposit.)

(9/100)

(iii) Jelas dan gambarkan proses pernormalan jadual di atas kepada Pernormalan Bentuk Kedua (2NF) dan Ketiga (3NF).

(7/100)

4. (a) Pertimbangkan dua jadual berikut:

JADUAL T1

P	Q	R
10	a	5
15	b	8
25	a	6

JADUAL T2

A	B	C
10	b	6
25	c	3
10	b	5

Tunjukkan hasil daripada operasi-operasi berikut:

(i) T1 *Inner Join* T2 di mana T1.Q < T2.B. (Ketidaksamaan adalah berdasarkan kepada perbandingan abjad; tunjukkan hasil kedua-dua Q dan B.)

(ii) T1 *Right Outer Join* T2 di mana T1.Q = T2.B.

(iii) T1 *Inner Join* T2 di mana T1.P = T2.A dan T1.R = T2.C.

(10/100)

(b) Diberikan jadual-jadual hubungan berikut:

Merchandise (ItemID, Description, Category, ListPrice, QuantityOnHand)
Order (PONumber, OrderDate, ReceiveDate, SID, EmpID, ShipCost)
OrderItem (PONumber, ItemID, Quantity, Cost)
Sale (SaleID, Date, CustomerID, EmployeeID)

Manakah barang dagangan yang mempunyai lebih daripada 400 bilangan dalam tangan yang belum pernah dipesan? Anda dibenarkan menjawab menggunakan *Outer Joi*n atau sub-pertanyaan.

(6/100)

(c) Jelaskan perbezaan antara pangkalan data teragih dengan proses teragih.

(5/100)

(d) Selama bertahun-tahun pakar keselamatan bimbang akan kecurian dan penipuan oleh mereka yang berkerja di syarikat. Salah satu cara untuk mengatasi perkara ini daripada berlaku ialah dengan mengadakan pembahagian tugasan antara para pekerja.

(i) Bagaimanakah aplikasi DBMS yang baik dapat menyediakan sokongan terhadap kawalan ini?

(ii) Berikan **satu (1)** contoh untuk menyokong alasan anda.

(6/100)