

KOLEJ UNIVERSITI TUNKU ABDUL RAHMAN
FACULTY OF APPLIED SCIENCES AND COMPUTING
ACADEMIC YEAR 2013/2014
MARCH/APRIL EXAMINATION

AACS3013 DATABASE DEVELOPMENT AND APPLICATIONS

WEDNESDAY, 16 APRIL 2014

TIME: 2.00 PM – 4.00 PM (2 HOURS)

DIPLOMA IN SCIENCE
(COMPUTER SCIENCE AND COMPUTER MATHEMATICS, INFORMATION SYSTEMS
ENGINEERING, BUSINESS INFORMATION SYSTEMS AND INTERNET TECHNOLOGY)

Instructions to Candidates:

Answer **ALL** questions. All questions carry equal marks.

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- Q1. (a) Sweet Sweet Sdn Bhd (SSSB) operates a dessert outlet that serves a variety of desserts such as bubble tea, frozen yogurt, mango pudding etc. There are two new outlets scheduled to be in operation in a few months' time with more outlets to be set up in their expansion plan.

The owner of SSSB, Mr Shito approached you and sought your advice on how to improve their existing business computer system which is still using **traditional file-based system (TFBS)** to maintain sales records.

Sales Table shown in **Figure 1** below is an example of data file stored in SSSB Sales System. After examining the data file, you noted that data redundancy exists in the file that may lead to **insertion, modification and deletion anomalies**.

Sales Table

Receipt No	Date	Outlet No	Location	Item No	Description	Price	Quantity
T150513-001	15/05/13	T13	TA Mall	B1	Bubble tea	5.90	2
T150513-001	15/05/13	T13	TA Mall	M3	Iced Mango	8.90	1
T150513-001	15/05/13	T13	TA Mall	Y1	Yogurt	9.50	1
G070513-002	07/05/13	G02	Gurney	M6	Mochi	7.50	1
P110413-007	11/04/13	P20	Paragon	B1	Bubble tea	5.90	1
T150513-002	15/05/13	T13	TA Mall	B1	Bubble tea	5.90	1
T150513-002	15/05/13	T13	TA Mall	S2	Soya Bean	5.50	1

Figure 1

[Note: Receipt No is a code designed to indicate the outlet, eg: T(outlet)150513(date)-001]

- (i) Briefly explain to Mr Shito what is meant by **data redundancy**. (2 marks)
- (ii) By referring to the table above, identify and explain to Mr Shito the problems that may occur with each of the **THREE (3)** data anomalies mentioned above. (6 marks)
- (b) Advice Mr Shito to transform its business computer system to Database Management System (DBMS). You need to justify your recommendation by carrying out the following tasks:-
 - (i) Briefly explain any **THREE (3)** advantages of using DBMS. (6 marks)
 - (ii) Briefly describe any **THREE (3)** functions of DBMS. (6 marks)
- (c) Mr Shito has since agreed to adopt the implementation of DBMS but he would like you to furnish him with further details of DBMS. For a start, outline to him the **FIVE (5)** components in the database system environment. (5 marks)

[Total: 25 marks]

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- Q2. (a) A **data model** is a simple representation of real-world data structure. A well-designed data model can foster a better understanding of the organisation for which the database is designed.

Briefly describe any **TWO (2)** reasons why data model is important in the above context. (4 marks)

- (b) While data model represents real-world data structure, **business rules** are used to identify and define the basic modeling component within a specific real-world environment.

Briefly explain any **TWO (2)** reasons why the process of identifying and documenting **business rules** is important to database design. (4 marks)

- (c) Aloha Enterprise is a medium-size boutique that sells women's apparels and accessories such as dress, blouse, pants, necklace etc. Customers must first register themselves as members. Attributes for **MEMBER** include MemberID (identifier), Name, Address and ContactNo. Each member may place one or more orders and each order is generated by a particular member. Attributes for **ORDER** include OrderNo (identifier), OrderDate, OrderTime and TotalAmount.

An order may list one or more product items (eg dress, bracelet etc). Each product item may be included in one or more orders. Attributes for **PRODUCT** include ProductNo, Description, Price and Category. Each time when an order is made, the quantity of each product ordered will be recorded.

The company provides shipment services for orders made. Attributes for **SHIPMENT** are ShipmentNo (identifier), ShipmentDate and Remarks. Each shipment may include one or more orders but each order must be delivered through one shipment only.

- (i) Draw an **Entity-Relationship Diagram (ERD)** to illustrate the above scenario using Crow's Foot notation. Resolve many-to-many relationship (if any). (11 marks)

- (ii) For each of the entities in the ERD drawn in Q2 (c)(i) above, list all relevant attributes using **Database Design Language (DBDL)**. In your listing, show all the primary keys and foreign keys (if any) clearly. Underline all the primary keys or composite keys and identify the foreign keys with an *.

(6 marks)

[Total: 25 marks]

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Q3. (a) Examine the relational tables shown in **Figure 2** below.

Book Table

<u>Book ID</u>	BookTitle	Publisher	Category Code
T001	Management Way	Sun Publisher	Mgm
F123	Investment	High n Low	Fnc
F564	Bull and Bear	Prentice Hall	Fnc
C300	Computing Today	Prentice Hall	Com
M11	Top Management	Twin Tower	Mgm

Category Table

<u>Category Code</u>	Description
Mgm	Management
Fnc	Finance
Com	Computer Science

Figure 2

The two relational database tables shown in **Figure 2** above are said to display both entity integrity and referential integrity.

- (i) Define "Primary Key" with **ONE (1)** example from the above tables. (2 marks)
 - (ii) Define "Foreign Key" with **ONE (1)** example from the above tables. (2 marks)
 - (iii) Entity integrity and referential integrity are based on primary key and foreign key. Briefly describe what is meant by **entity integrity** and **referential integrity** in the two tables above. (4 marks)
- (b) Consider the following Co-curriculum Registration table for a high school. The table contains repeating groups, which can lead to data inconsistency. To resolve this problem, you are required to normalise the table to a set of **third normal form** relations (3NF). Your answer should show all the three (**1NF**, **2NF** and **3NF**) steps of the normalisation process by using **Database Design Language (DBDL)**.

[Note: Underline the primary key or composite key and indicate the foreign keys with an *. Do not include any sample data. .]

Co-curriculum Registration Table

CoCu Code	Desc	Advisor No	Advisor Name	StuID ID	Stu Name	Stu Contact	Day	Time
BA11	Basketball	A911	Alan Tan	P213	May	245578	Monday	5:00pm
				P234	June	656588	Monday	5:00pm
				P786	Wynn	623918	Friday	6:30pm
TA20	Taekwondo	Y012	Yumiko	P213	May	245578	Sunday	9:00am
				P669	Hatta	398897	Sunday	9:00am
KA07	Karate	N023	Naruto	P008	Wong	258789	Tuesday	7:00pm
NE11	Netball	S56	Susan Ong	P318	Sammy	389965	Monday	6:00pm
				P234	June	656588	Saturday	8:00am

Figure 5

(17 marks)
[Total: 25 marks]

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- Q4. (a) UpTown Megamall is a five-storey shopping mall with 350 shop lots for rent. Their tenants are categorized according to their nature of business such as bookshop, computer hardware and accessories, children merchandises etc. These tenants will be located to the shop lots according to their respective category. All potential tenants must sign a tenancy agreement with the mall's management before moving into the shop lots. The mall maintains its tenants' records and their tenancy data by using database management system which consists of the following relations:

ShopLot (LotNo, RentableArea, LevelNo)

Tenant (TenantNo, Name, ContactNo, CompanyRegistrationNo, *CategoryNo)

TenantCategory (CategoryNo, Description)

TenancyAgreement (AgreementNo, DateOfAgreement, RentStartDate, RentEndDate, *LotNo, *TenantNo, MonthlyRentalAmount, DepositAmount)

Note: You are required to use the aliases for the given tables as follow (where appropriate):

- s for ShopLot
- t for Tenant
- c for TenantCategory
- a for TenancyAgreement

Write SQL statements to perform the following tasks:

- i. List the details of all shop lots which are located at 'level 3'. (3 marks)
 - ii. List the details of all tenants whose tenancy category fall under 'sportswear' category. (4 marks)
 - iii. Calculate the number of tenants whose rental will start in the month of October 2013. Display only "No of Tenant" in the result table. (4 marks)
 - iv. Calculate total rentable area in each level of the shopping mall. Display only LevelNo and "Total Rentable Area" and sort the result table in ascending order of LevelNo. (5 marks)
 - v. Upon further negotiation, the management has agreed to reduce the monthly rental amount by 5% and reduce the deposit amount by RM1000 to the tenant whose AgreementNo is 'AgLT105'. The date of agreement is updated to '01/01/2014'. Write an SQL statement to make the necessary modification. (5 marks)
- (b) Data administration is a high-level function that is responsible for the overall management of data resources in an organisation.

Briefly discuss any **TWO (2)** data administration functions.

(4 marks)

[Total: 25 marks]

