BACS1053 Database Management

Tutorial 1 & 2

1. Explain TWO (2) application areas of database system

2. Recommend **TWO (2)** factors when choosing the types of database.

3. File-based systems were first developed to store, manipulate and retrieve data but as business applications become more complex, it was evident to have a number of limitations. Describe any **TWO (2)** disadvantages of using a file-based system.

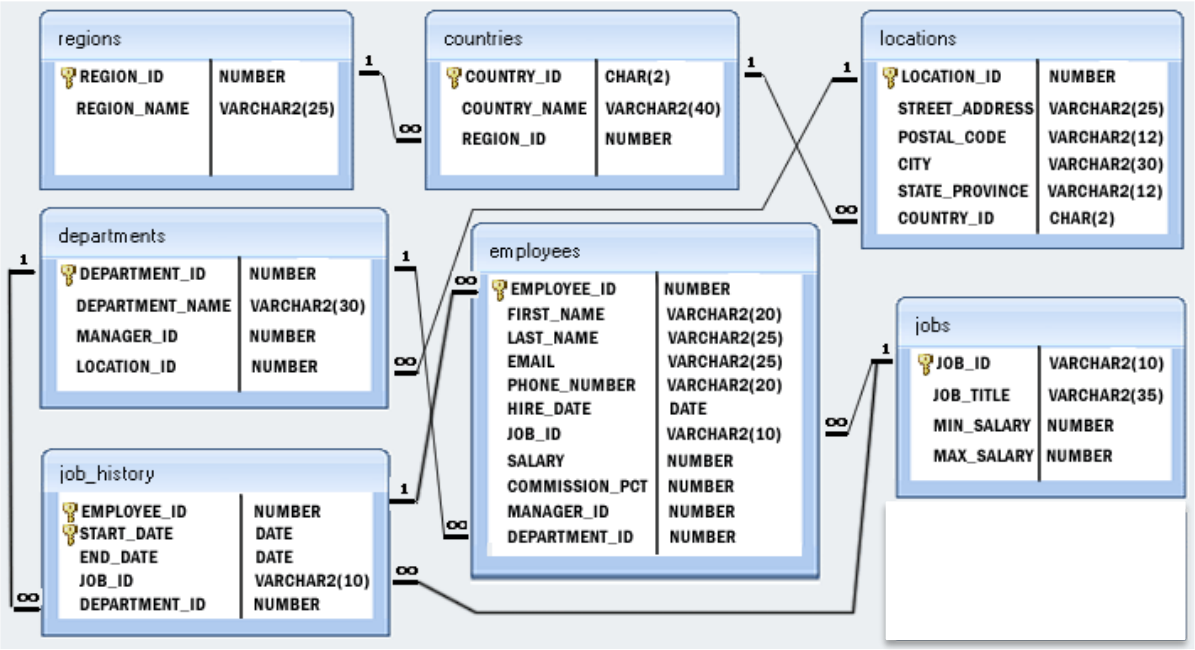
4. How a Database system can overcome the problems of File-Based system?

5. Describe FIVE (5) main components needed in database system environment.

6. A database management system (DBMS) performs several important functions to ensure the integrity and consistency of a data in the database. Briefly explain any FOUR (4) functions of a DBMS.

Tutorial 3 SQL

The **HR** Entity Relationship Diagram



2 files needed: Create Table, InsertData.

Create_HR.txt

HRdata.txt

In_HR.txt

Write **Structured Query Language (SQL) queries** to do the following:

Simple queries

1. Show the manager id, department id and department name for each department.
2. Show all employees with the first name ‘Alexander’.
3. Show employee numbers, last names, salaries, and managers’ employee numbers for all the employees whose manager’s employee number is 100, 101, or 201.
4. Show all employees (id, name) earning range from 5,000 to 10,000 for the department id is110 and sort the result from the highest to the lowest salary
5. Show all jobs (ID, title) that pay at least 15,000 salaries.
6. List all locations with a street address that has a number “8” in it.
7. Display the last name, job ID, and commission for all employees who are entitled to receive a commission.

Multiple table queries

8. List all employees (id, name) working in the state province of California.
9. List employees (id, name) working in countries beginning with the letter ‘C’.
10. List all employees that had worked as a "SALES REPRESENTATIVE" previously (not including the current job).
11. Show all salary details (job title, salaries) for the ‘Sales’ department.

Aggregate functions

12. How many employees had been a Stock Clerk previously?
13. How many current Stock Clerks are there?
14. Display the total number of employees who are worked in each job (include job_id, title).
15. Display the total number of employees who are worked in the same country, arrange by country id.
16. What is the total salary of each department located in Canada country?
17. What are the departments in 'United Kingdom' that have at least 5 employees?
18. List the job ID and total monthly salary for each job that has a total payroll exceeding 13,000. Exclude the sales representatives and sorts the list by the total monthly salary.

Update

19. The job id of an employee 105 is changed to ‘PU_MAN’ and the salary is increased by 5%.

Sub-query

20. List the employee_id, job_id, First_name and salary of the employees whose salary is more than the salary of Nancy (first_name).
21. List the total number of employees in each department, whose salary is more than average salary.
22. Remove all employees who worked at the department which has the word ‘ne’ in department name.
23. Increase employee’s salary as 5% who’s worked as a ‘Programmer’ (job title).

Tutorial 4: Data Models

Question 1

Describe any TWO (2) features of conceptual data model in database design.
Give an example of diagram to produce the conceptual data model.

Question 2

Explain TWO (2) main purposes of business rules in designing a database.

Question 3

Construct an ERD using Crow's Foot notation based on sample given:

Given sample record as below:

Ashah Computer Sdn Bhd

INVOICE customer copy

Customer Details
Customer ID : JE888 Invoice No:IV1001
Customer Name: Jane Eva Date : 11-Nov-2019
Contact No : 014-1234567 Branch : Sentul
Address:123,Taman Tun, Jalan USJ2,55100 KL. Sales representative: YapKC

Order Items Details:

Item No	Description	Quantity	Price	Amount
AC01	Acer Mouse	1	30.00	30.00
WK02	WirelessKeyboard	1	40.00	40.00
RA03	DDR3 Ram 8G	2	100.00	200.00
TP04	TPLink router	1	50.00	50.00

Total Paid: **320.00**

Each sales representative issues at least one invoice to a customer. Each invoice may listed many ordered items. Each customer may receive many invoices at different date issued.

Question 4

How to resolve many-to-many relationships between the 2 entities? Give an example for illustration.

Question 5

A newly establish social media company has requested you to design database to model memberships, message posted by members and comments collected.
The company would like to record member's information such as their id, name, phone number, and email address. Each member is allowed to post at least 1 message. Information captured from members' posted messages included id, posted title, date of the message is posted, privacy setting such as private or public. Each message posted may or may not receive comments. However, each time a comment is received, information about when the comment was posted, the total posted comment, commentID, and the content message will be recorded too. Each posted comment will be given a rating (rate 1 to 5) or none.

a) Draw an Entity-Relationship Diagram (ERD) for the above scenario using the *Crow's Foot notation* (exclude all attributes). Resolve many-to-many relationships, if any.

b) For each of the entities in the ERD drawn in part a), list all relevant attributes using Database Design Language (DBDL) format. In your listing, show all the primary keys and foreign keys (if any) clearly. Underline all the primary keys and identify the foreign keys with an *.

Question 6

Vitech Popular Bookstores (VPB), a chain of bookstores wants to keep track of the books it sells, their publishers(pearsoned, wiley), their authors, and the customers who buy them.

The BOOK entity has 4 attributes (Book Number(identifier), Name, Publication Year, Pages). A book has exactly one publisher. A book must have at least one author but can have many. A book that VPB carries may not as yet have been bought by any of its customers or may have been bought by many of its customers.
PUBLISHER has 5 attributes (Publisher Name, City, Country, Telephone, Year Founded); Publisher Name is the unique identifier of the PUBLISHER entity. A publisher may have published many books that VPB carries; however, VPB also wants to be able to keep track of some publishers that currently have no books in VPB's inventory.
For a person to be of interest to VPB as an author, she must have written at least one and possibly many books that VPB carries. An AUTHOR has 4 attributes (Author Number, Name, Year Born, Year Died); Author Number uniquely identifies an author.
For a customer to be of interest to VPB, he must have bought at least one book and possibly many. CUSTOMER has 6 attributes (Customer Number, Name, Street, City, State, and Country) with Customer Number as the unique identifier.

a) Draw an Entity-Relationship Diagram (ERD) for the above scenario using the *Crow's Foot notation* (exclude all attributes). Resolve many-to-many relationships, if any.

b) For each of the entities in the ERD drawn in part a), list all relevant attributes using Database Design Language (DBDL) format. 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 *.

Tutorial 5: Normalization

For all questions in part a):
Normalize the table to a set of Third Normal Form (3NF) relations. Your answer should show all the 3 stages of normalization (1NF, 2NFand 3NF) by using Database Definition Language (DBDL) format (underline all the primary key(s), composite key(s) and use an * to indicate the foreign keys). State the component that is or are removed from each Normal Form.

1. Dream Sdn Bhd is a tour agency is using traditional file-based system to manage and maintain all records of their customers' bookings. TourPackages Table shown below is an example of data file stored in their system.
   Sample Tour Package Records

Package code	Package Desc	Price	Tour Guide	TourGuide HP	CustNo	CustName	CustHP	DepartDate
B123	8 days Bangkok	4,800	Andy	011-1234567	Y88	YeohLW	016-9871234	02-02-2018
					L99	LeeQW	012-6547890	
					Y10	Yumiko	011-76589432	
					R22	Rina	010-97531246	
T007	10 days Turkey	10,800	Sally	012-9876543	S12	Susan	018-98712347	08-03-2018
E236	5 days England	5,800	Ryan	016-6520888	A98	Andrew	012-12347890	11-04-2018
					Z80	Zani	016-54632100	
J560	5 days Japan	6,800	Yuki	017-3850088	K34	Kumichi	011-91743002	09-05-2018
					P66	Pumar	019-7890088	
					N68	Natalie	010-8822569	

   (a) Normalize the table given to a set of third normal form (3NF) relations using DBDL format.

   (b) Based on the sample data given in the table, discuss each of the following data anomalies with a specific *example:*
      (i) Insertion anomaly
      (ii) Modification anomaly
      (iii) Deletion anomaly

2. Refer to the table below:

Normalize the table given below to a set of third normal form (3NF) relations using DBDL format.

Table shows the Student_Subject records:

Student Id	Student Name	Tutorial Class	Subject Code	Subject Title	Credit Hour	Tuition Fees	Grade
A001023	Bredly	M45	AACS2164	Database	4	280.00	B
A001023	Bredly	M45	AACS2184	System Design	3	210.00	B
A123450	Ai Li	M23	AAMS1234	Mathematics	5	350.00	C
A123450	AI Li	M47	AACS2164	Database	4	280.00	A
A112234	Branda	M40	AACS2164	Database	4	280.00	B
A009785	William	M44	AACS2184	System Design	3	210.00	C

Hint: The tuition fees are calculated based on the credit hour.

   (a) Normalize the table given to a set of third normal form (3NF) relations using DBDL format.

   (b) Based on the sample data given in the table, discuss each of the following data anomalies with a specific *example:*
      (i) Insertion anomaly
      (ii) Modification anomaly
      (iii) Deletion anomaly

3. The table shown below contains records about patients, health care providers, patients' visits to a clinic, and diagnoses made by health care providers.

HealthCare records:

VisitNo	**VisitDate**	**PatNo**	**PatAge**	**PatCity**	**PatZip**	**ProvNo**	**ProvSpecialty**	**Diagnosis**
V20030	13/1/2005	P1	35	Lahat	31600	D1	Internist	Ear Infection
V20030	13/1/2005	P1	35	Lahat	31600	D2	Nurse Practioner	Influenza
V82020	20/1/2005	P3	20	Tronoh	32200	D2	Nurse Practioner	Pregnancy
V73220	18/1/2005	P2	62	Taiping	34500	D3	Cardiologist	Murmur

Hint: The zip code of the patient can be used to determine the city.

(a) Normalize the table given to a set of third normal form (3NF) relations using DBDL format.

(b) Based on the sample data given in the table, discuss each of the following data anomalies with a specific *example:*
   (i) Insertion anomaly
   (ii) Modification anomaly
   (iii) Deletion anomaly

4. Given a Book_Order table as shown below, normalize it to a set of 3NF relations in DBDL.

Book Order Records

BookID	BookTitle	BookCategory	Publisher ID	Publisher Name	CourseID	CourseName	Order Copy
B001	Database	Computer	P101	Wiley	O111	Oracle	95
					M222	MySQL	55
B002	Programming	Computer	P101	Wiley	J888	Java Program	80
					C777	C++ program	60
B003	Business Accounting	Business	P102	Prentice	A211	Accounting	90
B004	Business Law	Business	P103	Pearsoned	A211	Accounting	66

(a) Normalize the table given to a set of third normal form (3NF) relations using DBDL format.

(b) Based on the sample data given in the table, discuss each of the following data anomalies with a specific *example:*
   (i) Insertion anomaly
   (ii) Modification anomaly
   (iii) Deletion anomaly

5. A sample of Delivery details is shown as below:

Delivery details records:

Delivery Order No	Delivery Order Date	CustID	HpNo	CustName	Address	Item Code	Description	Qty Delivered
DO001	12-05-19	AMD12	012587895	AMD Sdn Bhd	23 Taman Suria	CO98	Phone case	50
						AB56	Armband	30
						DP12	Dust plug	5
DO002	12-05-19	HP2X5	011789456	LTK Sdn Bhd	5 Willis Ave	PP65	Pouch	25
						CO98	Phone case	20
DO003	03-06-19	CK134	016963258	CK Enterprise	Sun Avn.	CP57	Cooler pad	10
DO004	12-08-19	AMD12	012587895	AMD Sdn Bhd	23 Taman Suria	CC23	Car charger	5
						PP65	Pouch	15
						CO98	Phone case	10

(a) Normalize the table given to a set of third normal form (3NF) relations using DBDL format.

(b) Based on the sample data given in the table, discuss each of the following data anomalies with a specific *example:*
   (i) Insertion anomaly
   (ii) Modification anomaly
   (iii) Deletion anomaly

Tutorial 6: Advanced SQL

1. What's the purpose of creating a view with *read only* and *with check* options?

Refer to the Tutorial 3: HR ERD, **Write SQL queries** to do the following:

2. Create a view that will display the following output when queried.

```
LOCATION                                 COUNTRY                          REGION
---------------------------------------- --------- ---------------- -------- -------------
1200 Tokyo Prefecture                    Japan                            Asia
1400 Texas                               United States of America         Americas
1500 California                          United States of America         Americas
1600 New Jersey                          United States of America         Americas
1700 Washington                          United States of America         Americas
1800 Ontario                             Canada                           Americas
1900 Yukon                               Canada                           Americas
2100 Maharashtra                         India                            Asia
2200 New South Wales                     Australia                        Asia
2500 Oxford                              United Kingdom                   Europe
2600 Manchester                          United Kingdom                   Europe
```

where the 'LOCATION' column is **location_id and state_province** combined;
'COUNTRY' column is the name of a country and
'REGION' column is the name of a region

Another requirement is do not include records that do not have state_province name.

Multiple table queries (from tutorial 3, Q8-Q11 (3,4,5 & 6))

Use the '**Joins with the ON Clause'** to answer the following.

3. List all employees (id, name) working in the state province of California.
4. List employees (id, name) working in countries beginning with the letter 'C'.
5. List all employees that had worked as a "SALES REPRESENTATIVE" previously (not including the current job).
6. Show the salary details (job title, salaries) for the IT department.
7. Display all employees who are worked in the same country.

OUTER JOINS

8. Based on the following records in Staff and Project tables, produce a resulting table after each of the following relational **Join** operations has been performed:
   -Staff **Left Outer Join** Project -Staff **Right Outer Join** Project

LEFT

Staff

Staff_Code	Staff_Name	Position
M01	John Tan	Manager
E01	Ahmad	Executive
S01	Gopal	Supervisor

RIGHT

Project

Project_No	Staff_Code
1010	M01
1011	E01
1012	E01
1013	C01

SET Operators

9. Based on the following records in StaffA and StaffB tables, produce a resulting table after each of the following relational **Set** operations has been performed:
   -StaffA **Union** StaffB -StaffA **Union All** StaffB -StaffA **Intersect** StaffB

StaffA

Staff_Code	Staff_Name	Position
M01	John Tan	Manager
E01	Ahmad	Executive
S01	Gopal	Supervisor

StaffB

Staff_Code	Staff_Name	Position
D01	Stephen	General Manager
E01	Ahmad	Executive
G01	Julia	Clerk
S01	Gopal	Supervisor

Tutorial 7: Database Administration and Security

1. How would you ensure data availability of system?

2. Recommend any **TWO (2)** features of database software security for online banking service.

3. Briefly describe the **FOUR (4)** DBMS facilities that are required for database backup and recovery.

4. Suggest **ONE (1)** suitable recovery technique for database destruction of online registration system.