



# National University

of Computer & Emerging Sciences FAST Peshawar Campus



Name: M. Ahsan

Roll No: P17-6112

Program: BS (CS)

Semester: Spring – 2019

Time Allowed: 3: 00 hour

Course: Database Systems

Examination: Final

Total Marks: 50 Weightage: 50

Date: 24 May, 2019

Instructor: Shoaib M. Khan

NOTE: Attempt all questions.

1. Based on the current tuples in the following table, find all candidate keys of the table. (6 pts)

A	B	C	D	E
$a_1$	$b_1$	$c_1$	$d_1$	$e_1$
$a_1$	$b_1$	$c_2$	$d_2$	$e_3$
$a_1$	$b_2$	$c_3$	$d_1$	$e_1$
$a_1$	$b_2$	$c_4$	$d_2$	$e_2$

2. Use Oracle Data Definition Language to create the following three tables: (6 pts)

Doctors(Dr id, Name, Specialty, Telephone, Years of experience)

Patients(Patient id, Name, Sex, Address, Age, Doctor id)

Records(Dr id, Patient id, Date, Diagnosis)

The primary key of each table is underlined. The Doctor id in the Patients table is used to indicate the primary physician of a patient. Each tuple in the Record table indicates that a doctor has seen a patient on the given date. Choose an appropriate data type for each attribute. Define appropriate foreign keys.

3. Consider the tables in Problem 2. For each question below, write a relational algebra expression AND an SQL query. (10 pts)

(a) Find the name of each doctor as well as the names of the doctor's patients who are over 60.

(b) Find the names of those male patients who have not seen a doctor.

4. Normalize the following form: (10 pts)

Course Code	23	Department	Business
Course Title	Business Accounting		
Level	3	Tutor	Trevor Allright
Mode of Attendance	Part Time		
Course Fee	£53.00	Dept Head	Mr Alan Parker
Start Date	20/08/2016		
End Date	24/08/2016		

Student ID Num.	Student Name	Student Address	Student Telephone	Student DOB	Enrolment Date	Enrolled By:-
14111	Alan Briggs	24 Abbey Park, Bangor, BT19 1PT	028 91462565 07798754623	10/02/94	10/06/16	Andrea Gilchrist
14132	Susan McBride	19 Belmont Road, Bangor, BT19 1TR	028 91488930 07891454255	01/01/93	03/07/16	David Toggles
14178	David Adair	14 Grange Park, Bangor, BT19 4TF	028 91584630 07891834277	06/11/87	03/07/16	Andrea Gilchrist

5. (10 pts)

Your task is to design a database for a banking system, which maintains information about customers and their accounts.

(a) Draw an ER diagram to model the application with the following assumptions:

- Each customer has a name, a permanent address, and a social security number.
- Each customer can have multiple phone numbers. ~~as~~ the same phone number may be shared by multiple customers.
- A customer can own multiple accounts, but each account is owned by a single customer.
- Each account has an account number, a type (such as saving, checking, etc), and a balance.
- The bank issues an account statement for each account and mails it to its account owner every month. As time goes on, there will be multiple statements of the same account.
- Each statement has an issued date and a statement ID. All the statements of the same account have different statement IDs, but two different accounts could have statements with the same statement ID. For example, it is possible that account A has a statement with ID 123, while account B has another statement with the same ID 123.

6. Show secondary index for Key field **staffNo** and non-key field **sex**. (6 pts)

staffNo	fName	iName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	10000	BR05
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000	BR03
SG14	David	Ford	Supervisor	M	24-Mar-58	18000	BR03
SA29	Mary	Howe	Assistant	F	19-Feb-70	9000	BR07
SG35	Susan	Brand	Manager	F	1-Jun-40	24000	BR03
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000	BR05

7. Show bitmap index for **position** in the table given in Problem 6. (3 pts)

8. (6 pts)

Consider the following relations:

Movie(Title, Year, Rating, StudioName)  
 Studio(Name, Country, Address)

Assume each movie is produced by just one studio, whose name is mentioned in the StudioName attribute of the Movie relation. Also, Title and Name are primary keys for Movie and Studio, respectively. The rating of a movie shows how good the movie is, and its range is {1,...,10}. The following statistics are available about the relations:

Movie	Studio	
T(Movie) = 24000	T(Studio) = 1000	T means Total # of records
V(Movie.StudioName) = 800		V means distinct values
V(Movie.Rating) = 10		

The following query returns the movies with a rating of 10 produced in each country after 1990:

```
SELECT Country, Title
FROM Movie, Studio
WHERE Movie.StudioName = Studio.Name and Year > 1990 and Rating = 10
```

Suggest an optimized logical query plan for the above query. Then, estimate the size of each intermediate relation in your query plan. By intermediate relation we mean the relation created after each selection or join.

9. When you book a flight on some airlines' web sites, you are shown a plan of the plane and asked to choose a seat. Once you have chosen the seat, you pass through a number of other screens before your purchase is completed. This process can take several minutes and you can abort the process at any time. (6 pts)

1. Describe what is meant by 'concurrency' in terms of the database behind this booking system.
2. Describe one problem that this concurrency could cause when customers are choosing their seat.
3. A transaction must be atomic, consistent, independent and durable. Describe what each of these four terms mean. What is the smallest transaction that satisfies these criteria in the airline example given here?



# National University

of Computer & Emerging Sciences Peshawar Campus



Program: BS (CS)  
Semester: Fall-2023  
Time Allowed: 03 hour  
Course: CS2005-Database Systems

Examination: Final  
Total Marks: 90, Weightage: 55  
Date: December 23, 2023  
Instructor: Shoalb M. Khan

NOTE: ATTEMPT ALL Questions.

## Entity Relationship Diagram

[CLO 2] [Marks =10]

UPS prides itself on having up-to-date information on the processing and current location of each shipped item. To do this, UPS relies on a company-wide information system. Shipped items are the heart of the UPS product tracking information system. Shipped items can be characterized by item number (unique), weight, dimensions, insurance amount, destination, and final delivery date. Shipped items are received into the UPS system at a single retail center. Retail centers are characterized by their type, uniqueID, and address. Shipped items make their way to their destination via one or more standard UPS transportation events (i.e., flights, truck deliveries). These transportation events are characterized by a unique scheduleNumber, a type (e.g. flight, truck), and a deliveryRoute.

Create an Entity Relationship diagram using crow's foot notation that captures this information about the UPS system. Be certain to indicate identifiers and cardinality constraints.

## Normalization

[CLO 3] [Marks =15]

The table below displays the grades obtained by students in the courses in which they have registered.

- ✓ Identify the functional dependencies that exist between the columns of the table.
- ✓ Normalize the table to the 3NF.

studentID	studentName	courseID	courseTitle	credits	grade	semesterID	semesterPeriod
S103	James Bradely	CS103	Data Analytics	3	B	Fall2022	Aug 25 - Dec 21
S103	James Bradely	CS395	DB Systems	3	A	Fall2022	Aug 25 - Dec 21
S105	Nancy Herman	CS395	DB Systems	3	A	Fall2022	Aug 25 - Dec 21
S103	James Bradely	CS395	DB Systems	3	F	Spring2022	Jan 24 - May 22
S103	James Bradely	MT206	Pre-calculus	4	C	Spring2022	Jan 24 - May 22
S105	Nancy Herman	MT206	Pre-calculus	4	B	Spring2022	Jan 24 - May 22
S105	Nancy Herman	CS103	Data Analytics	3	A	Spring2022	Jan 24 - May 22



## Structured Query Language

[CLO 5] [Marks=20]

Considering the employee database with the following schema, where the primary keys are underlined. Give an expression in SQL for each of the queries.

get emp ← city ← manager

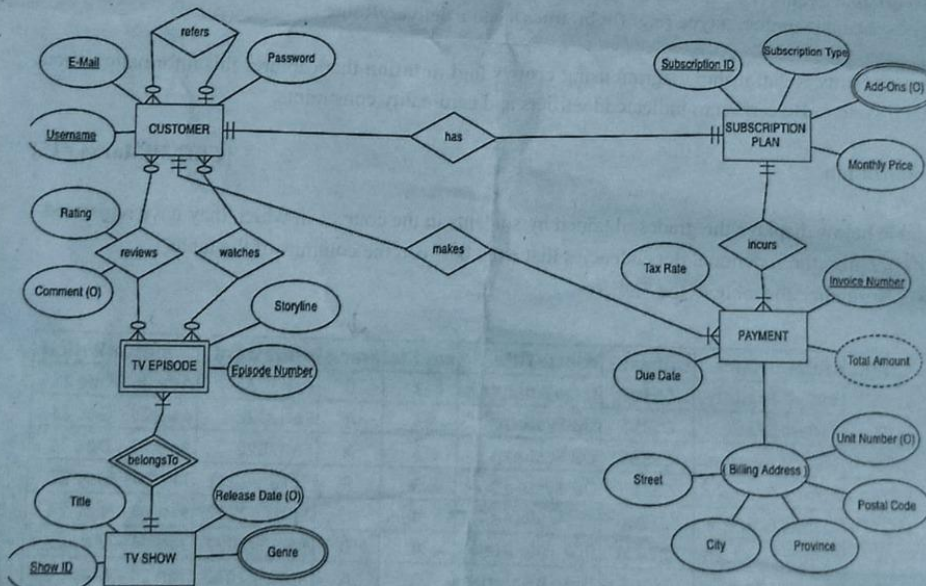
`employee (employee_name, street, city)`  
`works (employee_name, company_name, salary)`  
`company (company_name, city)`  
`manages (employee_name, manager_name)`

- Find the name of all employees who work for "First Bank Corporation".
- Find all employees in the database who live in the same cities as the companies for which they work.
- Find all employees in the database who live in the same cities and on the same streets also do their managers.
- Find all employees who earn more than the average salary of all employees of their company.
- Find the company that has the smallest payroll.

## Relational Model

[CLO 4] [Marks =15]

Transform the following ERD into Relational Database Schema.



1. Why can we have at most one primary or clustering index on a file, but several secondary indexes?
2. A PARTS file with Part# as the key field includes records with the following Part# values: 23, 65, 37, 60, 46, 92, 48, 71, 56, 59, 18, 21, 10, 74, 78, 15, 16, 50, 69, 8, 49, 33, 38. Suppose that the search field values are inserted in the given order in a B-tree of order  $p = 4$ ; show how the tree will expand and what the final tree will look like.
3. Consider the relation given below which stores details of faculty members in a university and answer the following questions accordingly. Assume each block can contain 2 records and the original data file is sorted by the primary key faculty-id.

faculty_id	name	surname	username	dept_code	current_title
1300	Hobard	Seabright	hseabright1	355	Assist. Prof.
1301	Shelly	Greendale	sgreendale2	355	Prof. Dr.
1302	Etienne	Mutlow	emutlow3	356	Assoc. Prof.
1303	Jon	Standall	jstandall7	357	Assoc. Prof.
1304	Man	Cathel	mcathel8	358	Prof.
1305	Kaila	Lembrick	klembrick0	355	Assist. Prof.
1306	Xena	Bosomworth	xbosomworth1	355	Assoc. Prof.
1307	Rhonda	Eyam	reyam5	356	Prof.
1308	Lonny	Koschek	lkoschek9	357	Assist. Prof.
1309	Carroll	Laroze	clarozea	357	Assoc. Prof.
1310	Elizabeth	Fabbro	efabbro	358	Prof.

- a. Show the structure of the index when the given table is indexed using current title.
- b. Show the structure of the index when the given table is indexed using faculty-id.

4. Consider the instructor relation shown below.

- a. Construct a bitmap index on the attribute salary, dividing salary values into 4 ranges: below 50000, 50000 to below 60000, 60000 to below 70000, and 70000 and above.
- b. Consider a query that requests all instructors in the Finance department with salary of 80000 or more. Outline the steps in answering the query and show the final and intermediate bitmaps constructed to answer the query.

10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000
33456	Gold	Physics	82000
45565	Katz	Comp. Sci.	75000
58583	Califieri	History	62000
76543	Singh	Finance	80000
76766	Crick	Biology	72000
83821	Brandt	Comp. Sci.	92000
98345	Kim	Elec. Eng.	80000





Name: \_\_\_\_\_

Roll No: \_\_\_\_\_

Program: BS (CS)  
Semester: Spring - 2022  
Time Allowed: 1: 00 hour  
Course: Database Systems

Examination: Sessional-II  
Total Marks: 34 Weightage: 15  
Date: 9<sup>th</sup> May 2022  
Instructor: Shoaib M. Khan

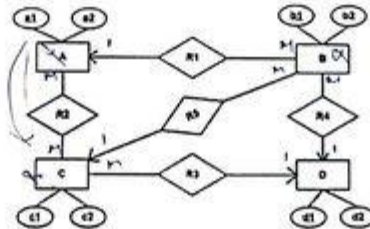
**NOTE:** Attempt all questions.

- 1 The table lists sample dentist/patient appointment data. A patient is given an appointment at a specific time and date with a dentist located at a particular surgery. On each day of patient appointments, a dentist is allocated to a specific surgery for that day.
  - ☒ The table is susceptible to update anomalies. Provide examples of insertion, deletion, and update anomalies. (6 marks)
  - ☒ Identify the functional dependencies represented by the attributes. State any assumptions you make about the data and the attributes shown in this table. (6 marks)
  - ☒ Describe and illustrate the process of normalizing the table to 3NF relations. Identify the primary, alternate, and foreign keys in your 3NF relations. (8 marks)

staffNo	dentistName	patNo	patName	appointment date	time	surgeryNo
S1011	Tony Smith	P100	Gillian White	12-Sep-13	10.00	S15
S1011	Tony Smith	P105	Jill Bell	12-Sep-13	12.00	S15
S1024	Helen Pearson	P108	Ian MacKay	12-Sep-13	10.00	S10
S1024	Helen Pearson	P108	Ian MacKay	14-Sep-13	14.00	S10
S1032	Robin Plevin	P105	Jill Bell	14-Sep-13	16.30	S15
S1032	Robin Plevin	P110	John Walker	15-Sep-13	18.00	S13

- 2 What are three possible approaches for mapping of binary 1:1 relationship type? Explain with examples. (6 marks)

☒ Find the minimum number of tables required for the following ER Diagram in relational model. (8 Marks)





Name: \_\_\_\_\_

Roll No: \_\_\_\_\_

Program: BS (CS)  
Semester: Spring – 2022  
Time Allowed: 1: 00 hour  
Course: Database Systems

Examination: Final  
Total Marks: 100 Weightage: 50  
Date: 21<sup>st</sup> June 2022  
Instructor: Shoaib M. Khan

NOTE: Attempt all questions.

**I ERD (20 marks)**

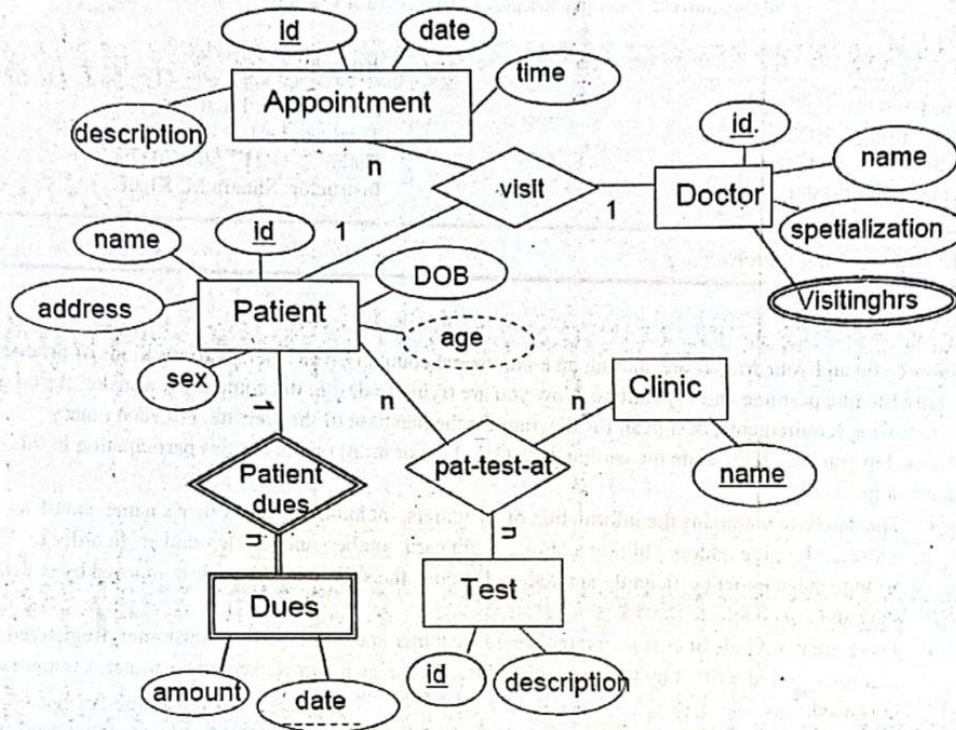
Suppose you and your friends are starting an e-commerce company which sells various kinds of products in daily life like perfume and toys online. Now you are trying to design the company's website. Based on the following requirements, design an ER diagram for the database of the website. For each binary relationship you identified, state the cardinalities (1:1, 1: m or m: n) on the entities participating in this relationship.

- The database maintains the information of customers, including the customer's name, email address, shipping address, billing address, credit card number, and phone number. In order to arrange the shipment efficiently and reduce the cost, the shipping address is composed by street, state and zip code.
- There are two kinds of customers, registered customer and non-registered customer. Registered customers are identified by their registered ids, and for each non-registered customer, a temporary id is used.
- A product has a product id, a name, its price, a supplier (from where this product is purchased) and a description. Each product is identified by the product id.
- Each product has a number of items. All the items from a same product are identical in looking, however, they are different in their item ids (imagine when you go to the supermarket, although you buy two same things, they have different barcodes). In addition, each item has a producing date. The item id alone is not enough to distinguish different items from all kinds of products; instead, it must be associated with its corresponding product id.
- Each customer can order many items at a time. When he/she is making an order, the date, time, and total amount of that order will be recorded. The total amount is not stored information but calculated each time when a customer makes an order, by adding all the prices of items together.
- Each product belongs to one or more categories. For example, a photographer's book can belong to both "book" and "photography". Each category includes many kinds of products. A category has its category number, its category name, and is identified by the category number.
- For each registered customer, you will keep track of his/her favorite categories. This will be useful when you suggest products for him/her in his/her future purchase. One customer can favorite in one or more categories, and for each of his/her favorite, you will keep record of the number of purchases he/she made in this category.



## 2 Transform ERD (15 marks)

Transform the ER model to a database schema. Identify the primary keys and foreign keys.



emp (eno, ename, bdate, title, salary, dno)  
 proj (pno, pname, budget, dno)  
 dept (dno, dname, mgreno)  
 workson (eno, pno, resp, hours)

## Queries (15 marks)

1. Write an SQL query that returns the project name, hours worked, and project number for all works on records where hours > 10.
2. Write an SQL query that returns the project name, department name, and budget for all projects with a budget < \$50,000.
3. Write an SQL query that returns the employee numbers and salaries of all employees in the 'Consulting' department ordered by descending salary.
4. Write an SQL query that returns the employee name, department name, and employee title.
5. Write an SQL query that returns the employee name, project name, employee title, and hours for all works on records.

descon

#### 4 Normalization (15 marks)

A company called *FastCabs* provides a taxi service to clients. The table shown below displays some details of client bookings for taxis. Assume that a taxi driver is assigned to a single taxi, but a taxi can be assigned to one or more drivers.

- Identify the functional dependencies that exist between the columns of the table and identify the primary key and any alternate key(s) (if present) for the table.
- Describe why the table is not in 3NF.
- The table is susceptible to update anomalies. Provide examples of how insertion, deletion, and modification anomalies could occur on this table.

JobID	JobDate Time	driverID	driver Name	taxiID	clientID	clientName	JobPickUpAddress
1	25/07/14 10:00	D1	Joe Bull	T1	C1	Anne Woo	1 Storrle Rd. Paisley
2	29/07/14 10:00	D1	Joe Bull	T1	C1	Anne Woo	1 Storrle Rd. Paisley
3	30/07/14 11:00	D2	Tom Win	T2	C1	Anne Woo	3 High Street, Paisley
4	2/08/14 13:00	D3	Jim Jones	T3	C2	Mark Tim	1A Lady Lane, Paisley
5	2/08/14 13:00	D4	Steven Win	T1	C3	John Seal	22 Red Road, Paisley
6	25/08/14 10:00	D2	Tom Win	T2	C4	Karen Bow	17 High Street, Paisley

#### 5 B+ Tree (10 marks)

A PARTS file with Part# as the key field includes records with the following Part# values: 23, 65, 37, 60, 46, 92, 48, 71, 56, 59, 18, 21, 10, 74, 78, 15, 16, 20, 24, 28, 39. Suppose that the search field values are inserted in the given order in a B+ tree of order  $p = 4$  and  $p_{leaf} = 3$ ; show how the tree will expand and what the final tree will look like.

#### 6 Bitmap Index (10 marks)

- Construct bitmap indexes on the attribute salary and department. Divide salary values into 4 ranges: below 50000, 50000 to below 60000, 60000 to below 70000 and above.
- Consider a query that requests all instructors in the finance department with salary above 70000. Outline the steps in answering the query.

10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000
33456	Gold	Physics	87000
45565	Katz	Comp. Sci.	75000
58583	Califieri	History	62000
76543	Singh	Finance	80000
76766	Crick	Biology	72000
83821	Brandt	Comp. Sci.	92000
98345	Kim	Elec. Eng.	80000

#### 7 Indexing Short Questions (15 marks)

- What are the differences among primary, secondary, and clustering indexes? How do these differences affect the ways in which these indexes are implemented? Which of the indexes are dense, and which are not?
- Why can we have at most one primary or clustering index on a file, but several secondary indexes?
- How does multilevel indexing improve the efficiency of searching an index file?





# National University

of Computer & Emerging Sciences FAST Peshawar Campus



Name: \_\_\_\_\_

Roll No: \_\_\_\_\_

Program: BS (CS)

Semester: Spring – 2022

Time Allowed: 1: 00 hour

Course: Database Systems

Examination: Sessional-I

Total Marks: 45 Weightage: 15

Date: 17 March 2022

Instructor: Shoaib M. Khan

**NOTE:** Attempt all questions.

1 Create the Entity Relationship Diagram for the library with following requirements: (15 marks)

- The library has many books, for each book we have its ISBN (unique), title, the number of copies, number of pages in this book, and the price.
- The library has two types of customers, either registered customers or un-registered customers. For all customers, we keep the ID (unique), name, DoB. For registered customers we keep additional information such as Registration ID, Tel. number, and the discount offer(s) available for that customer (can have several offers).
- Customers (either registered or not) can buy books; each customer can buy many books and can buy the same book on different dates. We want to capture the purchase date, the number of copies purchased, and the credit card (CC) info used in the transaction (CC number, expiry date, and 3-digit security number).
- Only registered customers can borrow books, where each borrow transaction has a borrow date and it can contain at most 3 books. Each borrowed book can be returned on a different date that we want to capture.
- The library maintains storage areas only for registered customers. Each area has an ID (unique), size, and rented price. Each area belongs to at most one customer and each customer can have at most one storage area.

2 Write the SQL Statements for the following: (15 marks)

Employee (SSN, name, salary, DNo)  
Department (DNo, DeptName, MgrSSN)  
Project (PNo, location, ProjName)  
HourLog (SSN, PNo, hours)

- Find the name and SSN of everyone who works more than 100 hours on a project.
- Find the SSN of everyone who is not working on any project.
- Find the name and SSN of everyone who works for department number 10 and also work on project number 345.
- Find the name and the SSN of everyone who works on at least two projects.
- For each project, find the SSN of everyone who works the longest hours for this project.

3 **Short Questions** (15 marks)

- Write the relational algebra expressions with output for any self join example.
- Explain the minimality property of Candidate Key with the help of example.
- Differentiate between Super Key and Candidate Key with the help of example.





# National University

of Computer & Emerging Sciences FAST Peshawar Campus



Name: \_\_\_\_\_

Roll No: \_\_\_\_\_

Program: BS (CS)

Semester: Spring – 2020

Time Allowed: 3: 00 hour

Course: Database Systems

Examination: Final

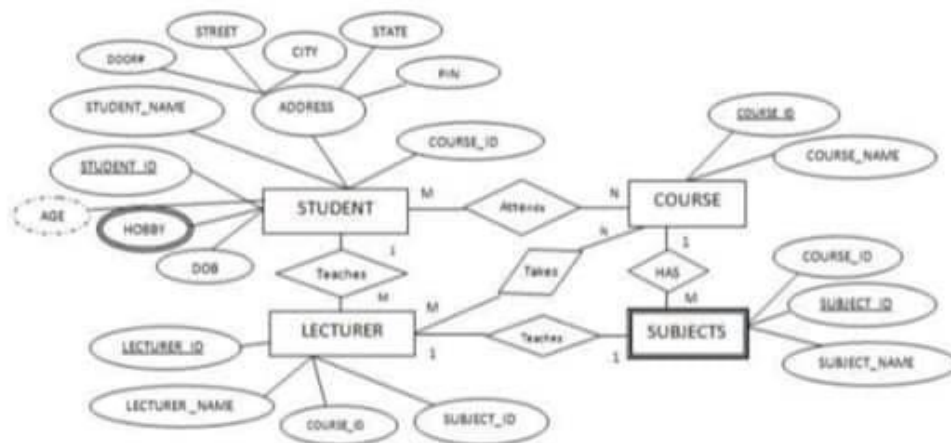
Total Marks: 80 Weightage: 50

Date: 26 June, 2020

Instructor: Shoaib M. Khan

**NOTE:** Attempt all questions.

1. Convert the following ERD into normalize tables.(15 marks)



2. Normalize the following invoice details. (15 marks)

Invoice details									
Inv. no.	Date	Customer	Cust. no.	Address	Inv. Item no.	Product	Prod no.	No.	Price
123	01/29/2018	John Public	11	35 Wood Lane, Springfield, ME 04487	1	Monitor	2-0023-D	10	\$200
123	01/29/2018	John Public	11	35 Wood Lane, Springfield, ME 04487	2	Mousepad	4-0023-D	12	\$05
123	01/29/2018	John Public	11	35 Wood Lane, Springfield, ME 04487	3	Chair	5-0023-D	1	\$120
124	01/30/2018	Jane Doe	12	72 Windy Road, Springfield, ME 04487	1	Laptop	1-0023-D	2	\$1,200
124	01/30/2018	Jane Doe	12	72 Windy Road, Springfield, ME 04487	2	Headset	3-0023-D	2	\$75

3. Consider the following table: (10 marks)

	Course	StudID	Grade
$r_0$	DMS	2100	18
$r_1$	ITP	2157	18
$r_2$	ITP	2230	30
$r_3$	DMS	2177	24
$r_4$	OS	2340	30
$r_5$	ITP	2200	23
$r_6$	DMS	2157	28
$r_7$	DB	2300	30
$r_8$	DMS	2263	25
$r_9$	DB	2299	28

- Show bitmap index on Course.
- Show secondary index on StudID.

4. Given is the following schedule over transactions  $T_1, T_2, T_3$ : (15 marks)

$T_1$	$T_2$	$T_3$
	read(Z) read(Y) write(Y)	
read(X) write(X)		read(Y) read(Z)
		write(Y) write(Z)
read(Y) write(Y)	read(X)	
	write(X)	

- Draw the precedence graph and show that the schedule is not conflict serializable.
- Design a concurrent schedule of  $T_1, T_2$ , and  $T_3$  that is conflict serializable. Specify also the equivalent serial schedule.

5. Consider these relations with the following properties: (10 marks)

$r(A, B, C)$   
30,000 tuples  
25 tuples fit on 1 block

$s(C, D, E)$   
60,000 tuples  
30 tuples fit on 1 block

- a. Estimate the number of disk block accesses required for a natural join of  $r$  and  $s$  using a nested-loop join if  $r$  is used as the outer relation.
  - b. Estimate the number of disk block accesses required for a natural join of  $r$  and  $s$  using a block nested-loop join if  $s$  is used as the outer relation. Assume that there are more than 2000 memory buffers available to facilitate this operation, where each memory buffer can buffer one disk block.
6. Answer the following questions: (15 marks)
- a. When and why is a multi-level index recommended?
  - b. When is a sparse secondary index useful?
  - c. Which ACID properties are ensured by the recovery system?







# National University

of Computer & Emerging Sciences FAST Peshawar Campus



Name: M. Ahsan

Roll No: P17-6142

Program: BS (CS)

Semester: Spring – 2019

Time Allowed: 1: 00 hour

Course: Database Systems

Examination: Sessional-I

Total Marks: 33 Weightage: 15

Date: 27 February, 2019

Instructor: Shoaib M. Khan

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**NOTE:** Attempt all questions.

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## Short Questions (15 marks)

- Why we switch from File Processing Systems to Database Systems?
- How we choose candidate keys.
- Differentiate between Entity integrity and Referential integrity.
- Explain how the cascade policy maintains foreign-key constraints.
- Explain self join with the help of example.

## Relational Algebra and SQL (18 marks)

Consider the following schema:

*Student*(UIN, Name, Age)

*Course*(CRN, CourseName, Credit)

*Take*(UIN, CRN)

Write the relational Algebra and SQL statements for the following queries.

- Find the Names of students who take the course with CourseName 'CS411'.
- Find the UIN of students who don't take any course with credit less than 4.
- Find the Name of students whose ages are greater than 18 or who take at least one 4 credit course.



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Name: M. Ahsan

Roll No: P17-6142

Program: BS (CS)

Semester: Spring - 2019

Time Allowed: 1: 00 hour

Course: Database Systems

Examination: Sessional-II

Total Marks: 26 Weightage: 15

Date: 5<sup>th</sup> April, 2019

Instructor: Shoaib M. Khan

**NOTE:** Attempt all questions.

## ERD (10 marks)

A video store rents movies to members. Each movie in the store has a title and is identified by a unique movie number. A movie can be in VHS, VCD, or DVD format. Each movie belongs to one of a given set of categories (action, adventure, comedy, ...). The store has a name and a (unique) phone number for each member. Each member may provide a favorite movie category (used for marketing purposes).

## Identify Update anomalies (6 marks)

Ename	Empno	Bdate	Dnumber	Department	Phonearea
John B.	100	1965-01-03	2	Computing Science	www1@fhsu
Smith L.	105	1955-10-12	2	Computing Science	www1@fhsu
James P.	110	1962-03-03	3	Computer Systems	www1@fhsu
Aarna R.	111	1976-11-23	4	Scientific Computing	www1@fhsu
Pia S.	112	1964-10-19	4	Scientific Computing	www1@fhsu

## Normalization (10 marks)

PROJ. NUMBER	PROJECT NAME	EMPLOYEE NUMBER	EMPLOYEE NAME	JOB CLASS	DATE HIRED	MONTHS	TOTAL COMPENSE
15	Evergreen	103	Jane E. Fawcett	Rec. Engineer	\$24.00	228	\$12,216.00
		104	John G. News	Database Designer	\$105.00	194	\$12,570.00
		105	Alice K. Johnson *	Database Designer	\$105.00	157	\$12,480.00
		106	William S. Smith	Programmer	\$25.75	134	\$3,450.00
		107	David H. Sear	System Analyst	\$36.75	228	\$22,356.00
Subtotal							\$18,242.00
18	Andor Wise	114	Arvid J. Jones	Applications Designer	\$48.75	344	\$1,336.00
		115	James J. Fawcett	General Support	\$18.36	403	\$3,017.00
		116	Alice K. Johnson *	System Analyst	\$36.75	224	\$1,347.00
		117	David H. Sear	OS Analyst	\$45.90	440	\$2,021.00
Subtotal							\$7,721.00
23		105	Alice K. Johnson	Database Designer	\$105.00	147	\$6,772.50
		106	Anna K. Johnson	System Analyst	\$36.75	408	\$4,620.00
		113	Robert F. Johnson	Applications Designer	\$48.75	134	\$1,336.00
		114	Geoff S. Smith	General Support	\$25.75	228	\$3,450.00
		115	William S. Smith	Programmer	\$25.75	128	\$3,450.00
Subtotal							\$19,628.50
25		107	Mark G. Jones	Programmer	\$25.75	344	\$8,740.00
		115	Steve B. Smith	System Analyst	\$36.75	408	\$4,620.00
		101	John G. News *	Database Designer	\$105.00	163	\$12,570.00
		114	Arvid J. Jones	Applications Designer	\$48.75	224	\$1,347.00
		108	Robert F. Johnson	System Analyst	\$36.75	224	\$1,347.00
		116	James J. Fawcett	General Support	\$18.36	403	\$3,017.00
		117	David H. Sear	OS Analyst	\$45.90	414	\$1,901.00
Subtotal							\$17,558.00
Total							\$62,241.50

\*Alice K. indicates project leader



# National University

of Computer & Emerging Sciences FAST Peshawar Campus



Name: \_\_\_\_\_

Roll No: \_\_\_\_\_

Program: BS (CS)

Semester: Spring 2018

Time Allowed: 1: 00 hour

Course: Database Systems

Examination: Sessional-II

Total Marks: 26 Weightage: 15%

Date: 29 March, 2018

Instructor: Shoaib M. Khan

NOTE: Attempt all questions.

1	<p>1. Draw an E-R diagram for the requirements below. 2. Translate your E-R diagram into SQL schema.</p> <p>You have been asked to build a database to handle information about law firms. Each <u>law firm</u> is identified by a name that is unique within a <u>city</u>, and also has a count of how many <u>non-lawyer</u> employees each firm employs. <u>Lawyers</u> are identified by their social security number, and also have a name, address, and salary. A lawyer may be employed by at most one firm. Each lawyer handles a load of <u>cases</u> identified by a case number. Cases may be handled by more than one lawyer, even if the lawyers work for different firms.</p>	10 marks																																			
2	<p>Normalize the following.</p> <table border="1"><thead><tr><th>PET ID</th><th>PET NAME</th><th>PET TYPE</th><th>PET AGE</th><th>OWNER</th><th>VISIT DATE</th><th>PROCEDURE</th></tr></thead><tbody><tr><td>246</td><td>ROVER</td><td>DOG</td><td>12</td><td>SAM COOK</td><td>JAN 13/2002 MAR 27/2002 APR 02/2002</td><td>01 - RABIES VACCINATION 10 - EXAMINE and TREAT WOUND 05 - HEART WORM TEST</td></tr><tr><td>298</td><td>SPOT</td><td>DOG</td><td>2</td><td>TERRY KIM</td><td>JAN 21/2002 MAR 10/2002</td><td>08 - TETANUS VACCINATION 01 - HEART WORM TEST</td></tr><tr><td>341</td><td>MORRIS</td><td>CAT</td><td>4</td><td>SAM COOK</td><td>JAN 23/2001 JAN 13/2002</td><td>01 - RABIES VACCINATION 01 - RABIES VACCINATION</td></tr><tr><td>519</td><td>TWEEDY</td><td>BIRD</td><td>2</td><td>TERRY KIM</td><td>APR 30/2002 APR 30/2002</td><td>20 - ANNUAL CHECK UP 12 - EYE WASH</td></tr></tbody></table>	PET ID	PET NAME	PET TYPE	PET AGE	OWNER	VISIT DATE	PROCEDURE	246	ROVER	DOG	12	SAM COOK	JAN 13/2002 MAR 27/2002 APR 02/2002	01 - RABIES VACCINATION 10 - EXAMINE and TREAT WOUND 05 - HEART WORM TEST	298	SPOT	DOG	2	TERRY KIM	JAN 21/2002 MAR 10/2002	08 - TETANUS VACCINATION 01 - HEART WORM TEST	341	MORRIS	CAT	4	SAM COOK	JAN 23/2001 JAN 13/2002	01 - RABIES VACCINATION 01 - RABIES VACCINATION	519	TWEEDY	BIRD	2	TERRY KIM	APR 30/2002 APR 30/2002	20 - ANNUAL CHECK UP 12 - EYE WASH	10 marks
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