	King Saud University College of Computer and Information Sciences Department of Information Systems **Introduction to Database Systems (IS230) (3-0-1)** **Second Semester 1436/1437 (Spring 2018)**	
	Secoind Midterm Exam - April 12, 2018	
	Total Points : 150 Points	
Student Name	**Answe Model** **(Last, Middle, First)**	
	Student ID Number:	

Student Outcomes (SOs) Covered by Course

Outcome	Student Outcome Description	Coverage
(B)	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution	√
(C)	An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs	√
(G)	An ability to analyze the local and global impact of computing on individuals, organizations, and society	√
(I)	An ability to use current techniques, skills, and tools necessary for computing practice.	√
(J)	An understanding of processes that support the delivery and management of information systems within a specific application environment.	√

Course Learning Outcomes (CLOs) vs. Student Outcomes (SOs)

#	Course Learning Outcomes	Student Outcomes				
		B	C	G	I	J
1	Express a query using Relational Algebra		X			
2	Design the Database Schema of a database		X			
3	Use professionally Structured Query Language (SQL)				X	

Question	Q1	Q2	Q3	Q4	Total
SO covered	I	C	I	C	/150
Points	30	30	42	48	
Score					

Q1) (30 Points) Answer All Multiple Choice Questions (MCQ) :

Q1) _____ is a set of commands used to control a database, which includes security.
A) DCL
B) DPL
C) DML
D) DDL

Q2) The SQL command _____ adds one or more new columns to a table
A) Create table
B) Create relationship
C) Create view
D) Alter table

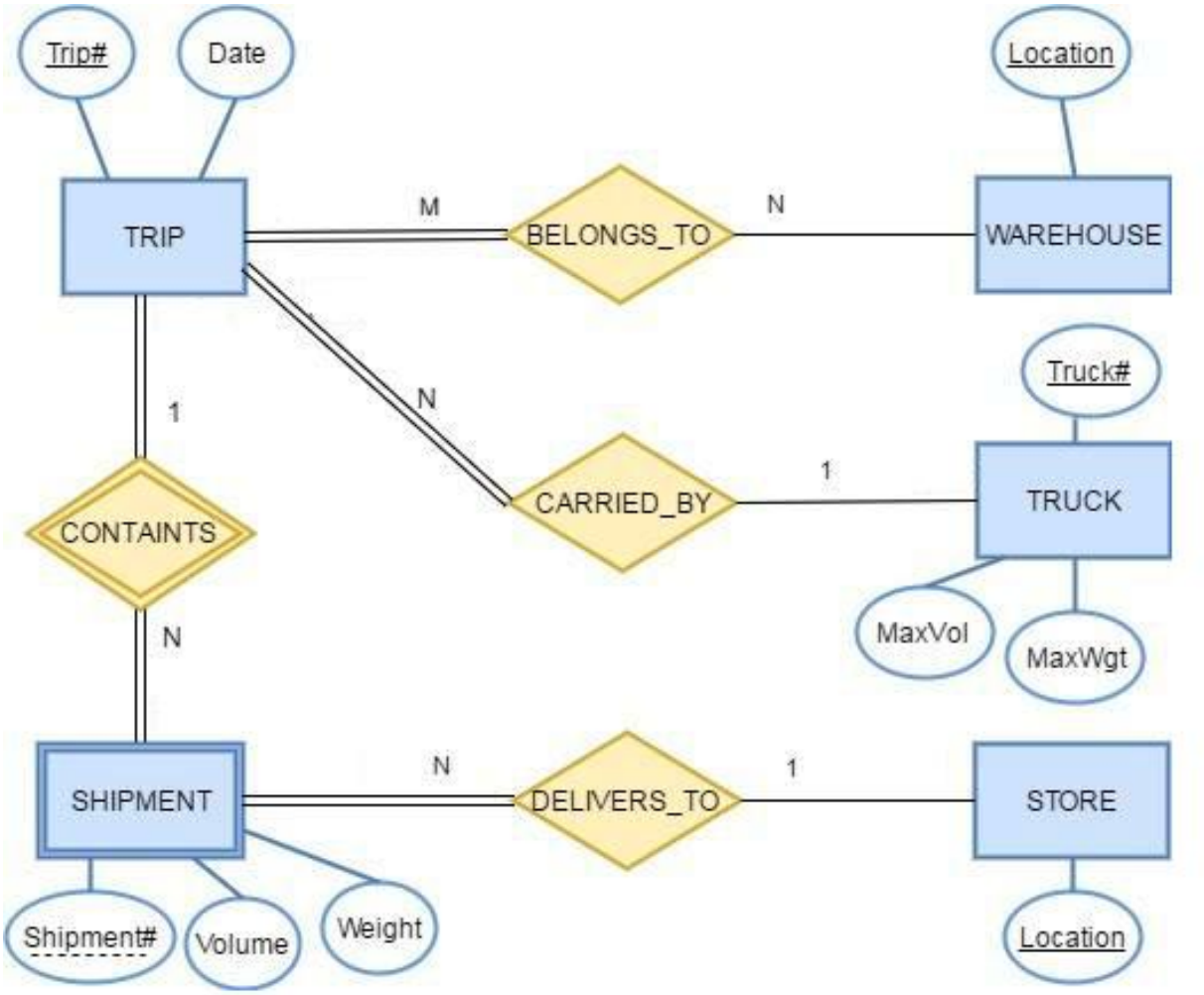
Q3) What does the following SQL statement do? ***Delete from Customer_T*** ***where state = 'HIIII';***
A) Deletes all records from the customer_t table
B) Removes the customer_t table from the database
C) Deletes all records from customer_t where the state is equal to HIIII
D) None of the above

Q4) What does the following SQL statement do? ***Update Product_T*** ***Set Unit_Price = 775*** ***Where Product_ID = 7***
A) Changes the unit price of Product 7 to 775
B) Changes the price of a unit called Product_T to 7
C) Updates the Product_T table to have a unit price of 775
D) Changes the length of the Unit_Price field to 775

Q5) What does the following SQL statement do? ***Alter Table Customer_T*** ***Add (Type Varchar (2));***
A) Alters the Customer_T table by adding a 2-byte field called "Varchar"
B) Alters the Customer_T table to be a Type 2 Varchar
C) Alters the Customer_T table to accept Type 2 Varchars
D) Alters the Customer_T table, and adds a field called "Type"

Q6) Which of the following questions is answered by the SQL statement? ***Select Count (Product_Description) from Product_T;***
A) How many characters are in the field name "Product_Description"?
B) How many different columns named "product Description" are there in table Product_T?
C) How many products are in the Product Table?
D) How many products have product descriptions in the Product Table?

Q2) (30 points) Design the relational Database Schema diagram for the following ERD (don't forget to underline primary keys and use pointers for all the foreign keys):



Truck (Truck#, MaxVol, MaxWgt)
Trip (Trip#, Date, Truck#)
Shipment (Trip#, Shipment#, Volume, Wight, S-Location)
Store (S-Location)
Warehouse (W-Location)
Warehouse-Trip (Trip#, W-Location)

Q3) (42 points) Consider the following Car database where primary keys are underlined:

Person

Name	age	city
Ahmed	22	Riyadh
Yacine	39	Jeddah
Faysal	35	Dammam

Car

License	color	year	MId
5222klj	red	2015	Porsche510
3678jdd	green	2018	Impala
2599dnf	yellow	2012	E300

Owns

Name	License	buy-year
Ahmed	5222klj	2016
Ahmed	3678jdd	2018
Yacine	2599dnf	2015

Model

MId	brand	price	weight
Porsche510	Porsche	250000	1300
Porsche310	Porsche	190000	1400
Impala	GM	26000	3000
E300	Mercedes	100000	2800

Write SQL statement corresponding to the following queries

Query #1	**List full details of all green cars whose owner name contain "ysa" in ascending Order**
SQL	**SELECT P.Name, P.age, P.city** **FROM Person P, Car C, Owns O** **WHERE P.Name = C.Name AND C.Licesne= O.Licesne AND** **O.Name like "%ysa%" AND C.color = 'green'** **Ordered by Name ASC;**

Query #2	**List the owner names and buying year for all red cars with price greater than $100,000 for owner who lives either in Jeddah or dammam.**
SQL	**SELECT O.Name , O.buy-year** **FROM Car C, Person P, Owns O, Model M** **WHERE P.Name = O.Name AND O.License = C.License AND** **C.color = "red" AND M.price > = 1000000 AND** **P.City IN(Jeddah, Dammam);**

Query #3	**For each Person who has more than two cars, retrieve the Person name , age, Licesne number, and the color of car purchased during 2016.**
SQL	**SELECT P.Name , P. age, C. Licesne , C.color , COUNT(*)** **FROM Person P, Owns O, Car C** **WHERE P.Name = O.Name AND C.License= O.License** **AND Buy-year = 2016** **GROUP BY Name** **HAVING COUNT (*) > 2 ;**

Query #4	**Display the car license number, color, and car maximum price of all cars model with weight less than or equal 2500 KG.**
SQL	**Select M.License, C.color , MAX(price)** **From Car C, Model M** **Where C.Mid = M.Mid AND M.weight <=2500;**

Query #5	**Find cars that are more expensive than all those produced By "Porsche".**
SQL	**SELECT C.License** **FROM Car C, Model M** **WHERE C.Mid= M.Mid AND M.price > ALL (SELECT price** **FROM Model** **WHERE M.brand = 'Porsche ');**

Query #6	**Retrieve the name of car owners who own either yellow car or Mercedes car.**
SQL	**(SELECT O.Name** **FROM Car C, Owns O** **WHERE O.license = C.license AND C.color = 'yellow ')** **UNION** **(SELECT O.Name** **FROM Car C, Owns O, Model M** **WHERE O.license = C.license AND M.MId= Car.MId AND M.brand = 'Mercedes');**

Q4) (48 Points) Consider the above database state mentioned in question #3

1. Write the equivalent relational algebra query for the following SQL query:
SELECT * FROM owns NATURAL JOIN car WHERE year > 2013 and owner = 'Yacine';

$\sigma_{\text{year} > 2013 \text{ AND owner} = \text{'Yacine'}}$ (owns ⊠ car)
⊠: Natural join

2. What is the output of the following relational algebra query: (⟕ is the left outer join)
$\Pi_{\text{person.name, person.city. owns.license}}$ (person ⟕ owns)

name	city	license
Ahmed	Riyadh	5222klj
Ahmed	Riyadh	3678jdd
Yacine	Jeddah	2599dnf
Faysal	Dammam	null

3. Write a query in relational algebra that returns the model Id and brand of cars owned by Waleed

$\Pi_{\text{mId, brand}}$ ($\sigma_{\text{name} = \text{'Waleed'}}$ (owns ⊠ car ⊠ model))

4. Write a query in relational algebra that returns the average weight of car models per brand

$_{\text{brand}}\,g_{\text{avg(weight)}}$ (model)

5. Write a query in relational algebra that lists the persons who own cars from Porsche and Mercedes brands

Π_{name} (($\sigma_{\text{model} = \text{"Porsche"}}$ (owns ⊠ car ⊠ model))
∩ Π_{name} ($\sigma_{\text{model} = \text{"Mercedes"}}$ (owns ⊠ car ⊠ model))

6. Write a query in relational algebra that deletes cars produced before 1950 (year<1950)

car ← car – $\sigma_{\text{year} < 1950}$ (car)

7. Write a query in relational algebra that increases the price of Porsche cars by 6 percent

model ← (model – ($\Pi_{\text{mId, brand, price, weight}}$ ($\sigma_{\text{brand} = \text{"Porsche"}}$ (model))))
∪ ($\Pi_{\text{mId, brand, price*1.06, weight}}$ ($\sigma_{\text{brand} = \text{"Porsche"}}$ (model)))

Good Luck and Best