Lab Manual

Databases

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| --- | --- |
| Faculty | Information Technology |
| Department | Computer Information Science |
| Course Number |  |
| Course Name | Databases |

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# Lab Manual Overview

This lab manual enables students to learn Structured Query Language (SQL). Students will use Oracle to create and manage tables, relationships between tables, manipulating table contents, and using complex select statements to retrieve information from tables. Students will also learn the basics of database administration such as creating and deleting users, granting and revoking privileges.

# Required Tools and Resources

|  |  |
| --- | --- |
| Number | Name |
| 1 | Oracle SQL Live |
| 2 | Oracle Database Express Edition |

Rules and Policies

## Before you come to the lab session

* + Bring your notebook so that you write notes
  + Do not bring any food or beverage to the lab
  + Be sure to come on time to make sure you follow lab exercises with other students.
  + Be sure to remember your student account username and password

## While being in the lab session

* + Interact with the lab supervisor. Do not hesitate to ask him questions
  + Maintain silence and discipline while being in the lab
  + Show cooperation with your fellow students
  + Log in to your computer using your student account
  + Make sure you complete your lab exercises

## After finishing the lab session

* + Make sure the place you are using is clean
  + Put your chair or any material you have used back to its proper place
  + Make sure to logout of your student account

## Attendance

* + You are required to come on time, otherwise you will be considered absent
  + Absence from lab sessions is recorded and will be used for your final course grade
* Grading
  + Lab supervisor will record your progress during each lab session
  + You are required to solve and submit any assignments the lab supervisor assigns to you
  + Your final lab grade is based on your overall performance during lab sessions

# Learning Outcomes

|  |  |
| --- | --- |
| Exercise | Learning Outcome |
| 1 | Creating and dropping tables and dealing with different data types |
| 2 | Adding, deleting, modifying, and renaming attributes and renaming table |
| 3 | Picking the correct primary key of tables |
| 4 | Defining primary keys using alter table |
| 5 | Removing primary keys, using not null, and using the view ‘user\_constraints’ |
| 6 | Defining check constraints |
| 7 | Dealing with insert, update, and delete statements to manipulate table content |
| 8 | Using foreign keys and dropping tables that are connected via primary key/foreign key relationship |
| 9 | Defining secondary keys, more practice on primary key/foreign key relationships |
| 10 | More practice on insert, update, and delete statements |
| 11 | Use select statement (where clause, order by clause) |
| 12 | Use select statement (aggregate functions, group by, distinct, computed result) |
| 13 | Using subqueries (exists, not exists, in, not in) |
| 14 | Using join to retrieve result from several tables |
| 15 | Use update and delete statements that contains subqueries |
| 16 | Use >all , >any, union, intersect, and minus |
| 17 | Using commit and rollback |
| 18 | Creating and dropping users, granting and revoking privileges |

# Exercise 1

Create the following tables. When you are done, delete table hall and table instructor

course

student instructor

|  |  |  |
| --- | --- | --- |
| crsNo | crsName | Credits |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sid | name | Address | Gpa | dob | gender |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Id | name | Address | Major | dob |

hall

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hid | Hname | maxCapacity | hallType | datashow |

* hallType is a one digit integer
* datashow is a one digit integer

# Exercise 2

employee

* Type of gender is number 1- Create the above table

|  |  |  |
| --- | --- | --- |
| Aid | name | gender |

1. Add attribute ‘dob’ (date of birth) to the table
2. Increase the capacity of name attributes by 10 characters 4- Change type of gender to char(1)

5- Rename attribute ‘name’ to ‘empname’ 6- Rename table to ‘emp’

# Exercise 3

Create the following tables. Take the following notes into consideration.

* You need to think of the appropriate primary key for each table
* Use the best way for defining primary keys (using a constraint)
* Give the constraints a meaningful name

course

|  |  |  |
| --- | --- | --- |
| cid | Cname | Credits |

prerequisite

requisitecid

cid

section bank

name

bankid

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| secid | crsid | Semester | Year | hallNo | instID | fromTime | toTime | days |

bankbranch borrowBook

|  |  |  |
| --- | --- | --- |
| bankid | branchid | Address |

|  |  |  |  |
| --- | --- | --- | --- |
| bookID | copyNum | customerID | borrowDate |

# Exercise 4

Create the following tables using create table statement, and then use alter table statement to define the primary key of tables. Make sure you use constraints in the alter table.

library

Name

Libid

libraryBranch

|  |  |  |
| --- | --- | --- |
| libid | Branched | Address |

# Exercise 5

|  |  |  |  |
| --- | --- | --- | --- |
| plateNo | Model | year | color |

|  |  |  |
| --- | --- | --- |
| car |  | |
|  |
|  | 1- | Create the previous table such that ‘model’ is the primary key |
|  | 2- | Now, the primary key ‘model’ is not the correct primary key, so remove the primary key |
|  | 3- | Use alter table to define the correct primary key of the table |
|  | 4- | Use alter table to make the attribute ‘model’ not null |
|  | 5- | Use the view ‘user\_constraints’ to retrieve the constraint name that represents the primary key |
|  |  | of the table |

# Exercise 6

hall

|  |  |  |  |
| --- | --- | --- | --- |
| hallNo | hallType | macCapacity | dataShow |

1. Create the above table such that hallNo is the primary key
2. Define a check constraint which makes the allowed values for hallType ‘Theory’, ‘Lab’
3. Define a check constraint that makes sure maxCapacity values are always greater than zero 4- Define a check constraint that makes the allowed values for datashow 0 or 1

5- Remove the constraint you created in the previous question and make a new constraint that makes the allowed values for datashow ‘true’ or ‘false’

# Exercise 7

animal

|  |  |  |  |
| --- | --- | --- | --- |
| Aid | Type | Dob | cageNum |

cage

|  |  |  |
| --- | --- | --- |
| cageNum | Area | Location |

1. Create the previous tables and make sure you define their primary keys
2. Insert 3 animals in table animals, use default date format and other date formats 3- Insert 3 cages in table cage
3. Make all tigers move to cage number 5
4. For cages located in ‘east’, increase their area by 10 square meters
5. If a cage area is greater than 100 square meters, then move it to ‘west’ location 7- Delete all animals that are older than 20 years

8- Delete all tigers if they live in cage 7 or cage 9.

# Exercise 8

Create the tables below and make sure you:

* Define primary keys of tables using constraints and put foreign keys in their corresponding tables
* Make Primary Key/Foreign Key relationships using alter table with constraints
* Make sure to give constraints meaningful names
* Delete table hotel, then table hotelBranch, then table Room

hotel

name

hotelID

Room

hotelBranch

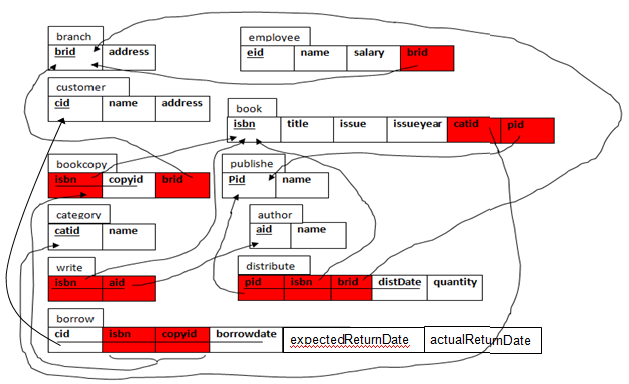
|  |  |  |
| --- | --- | --- |
| hotelID | branchid | Address |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| hotelID | branchID | roomed | smoking | numOfBeds |

# Exercise 9

Create the tables below and make sure you:

* Define primary keys of tables using constraints and put foreign keys in their corresponding tables
* Make Primary Key/Foreign Key relationships using alter table with constraints
* Make sure to give constraints meaningful names
* Make book title a secondary key



# Exercise 10

Given the DB schema in exercise 9, answer the following:

1. Insert few records in each table
2. For books borrowed by customer 6, add 1 week to their ‘expectedReturnDate’ 3- For book with isbn 6, change author id to 9.
3. For distribute operation done on book 10 in date 21-Apr-80, decrease quantity of books distributed by 10.
4. Move all copies of book 650 to branch 8. 6- Delete books that belong to category 3. 7- Delete all customers who live in Amman.

# Exercise 11

Given the DB schema in exercise 9, answer the following:

1. Find books issued in 2015
2. Find book isbn and name for books that belong to category 8 3- Find customer name for customers living in Amman

4- Find customer ID for customers who did not return books 5- Find isbn and copyNum for books that are returned late

1. Find isbn and copyNum for books that are returned early
2. Find isbn and copyNum for books that are returned on time
3. Find isbn for books that are distributed to branches with quantity greater than 100 copies 9- Find all books ordered alphabetically based on their title

10- Find all books ordered in descending order based on issueYear and if issueYear is equal for books, then order them alphabetically based on their title

# Exercise 12

Given the DB schema in exercise 9, answer the following:

1. Find count of books
2. Find book isbn and count of copies of book
3. Find count of books that belong to category 8 4- Find count of customers living in each address
4. Find count of books borrowed by each customer
5. Find book isbn and count of times it was borrowed
6. Find book isbn, copyNum and count of times the copy was borrowed 8- Find book isbn and count of authors for the book
7. Find author id and count of books he authored
8. Find maximum late days for books that are returned late
9. Find book isbn, copyNum, fine such that the book is returned late 12- Find authored such that he authored more than 4 books

13- Find customerID such that he borrowed more than 7 books 14- Find unique addresses of customers

15- Find book information for books which their title contains the word ‘Friday’

# Exercise 13

Given the DB schema in exercise 9, use **sub-queries** to answer the following:

1- Find customer name for customers who did not borrow any book 2- Find book title for books that are never borrowed

3- Find book isbn, copyNum for book copies that are never borrowed 4- Find book title for books that are borrowed more than 3 times

5- Find customer name for customers who never returned books late

# Exercise 14

Given the DB schema in exercise 9, answer the following:

1. Find book title, customer name who borrowed it
2. Find book title for books borrowed by customer ‘Ahmad’ 3- Find book title for books authored by author ‘Sara’
3. Find book title, category name it belongs to
4. Find book title,copyNum,customer name who borrowed the book such that the book is not returned yet
5. Find book title,copyNum,customer name who borrowed the book such that the book is not returned yet and its return date has passed.
6. Find book title,copyNum,customer name, fine for books that are returned but they are returned late.
7. Find book title for books borrowed by customer ‘Ahmad’ and authored by author ‘Sara’. Order the returned result alphabetically by book title
8. Find customer name and count of times he borrowed books
9. Find book title and count of times it was borrowed for books that has issue date = 2015 and authored by author ‘Ahmad’

# Exercise 15

Given the DB schema in exercise 9, answer the following:

1. Increase expectedReturnDate by 1 week for books entitled ‘Java Basics’ issued in 2015
2. Increase expectedReturnDate by 1 week for books that are borrowed by customer ahmad and they are not returned yet
3. Delete all books that are never borrowed
4. Change category of book ‘Java Basics’ to ‘Programming’ 5- Change publisher of book ‘Java Basics’ to ‘Dar AlHadi’

# Exercise 16

Given the DB schema in exercise 9, answer the following:

1. Find book titles for books who has issueYear greater than any issueYear for books that belong to category ‘Science’
2. Find book titles that belong to category ‘Science’ that are borrowed more than all books that belong to category ‘History’
3. Use Join to find book titles that belong to category ‘science’ and authored by author ‘Ahmad’ 4- Solve the previous question using ‘Union’
4. Use ‘subqueries’ to find customer name for customers who never borrowed books and they live in ‘Amman’
5. Solve the previous question using ‘intersect’
6. Use subqueries and Join to find customer name for customers who borrowed books that belong to category ‘Science’ and they never borrowed books that belong to category ‘History’
7. Solve the previous question using ‘minus’

# Exercise 17

car

|  |  |  |
| --- | --- | --- |
| plateNo | Model | year |

1- Create the previous table such that cid is the primary key 2- Create an index on attribute ‘model’

1. Insert 2 students
2. Make sure changes so far are permanently saved into DB 5- Insert 2 more students
3. Cancel the effect of the previous two insert statements
4. Delete all ‘Honda’ cars
5. Cancel the effect of the previous delete statement

# Exercise 18

1- Log in to SQL Plus using the ‘system’ administrator account 2- Create a new user ‘ahmad’ with password ‘abc’

1. Allow user ‘ahmad’ to login to SQL Plus
2. Allow user ‘ahmad’ to create and manipulate tables 5- Login as user ‘ahmad’

6- As user ‘ahmad’, create table ‘student’ and insert 1 record in it 7- Login as user system

8- Create user ‘kamal’ with password ‘xyz’ 9- Allow user ‘kamal’ to login to SQL Plus

10- Allow user ‘kamal’ to only create tables and select tables 11- Login as user ‘ahmad’

12- As user ahmad, give user ‘kamal’ the privilege to view content of table student