



National University of Computer & Emerging Sciences, Karachi
Spring-2020 CS-Department
Final Exam



27th June 2020, 9:00 am – 12:30pm

Course Code: CS203	Course Name: Database Systems
Instructor Name : Miss Tania Iram	
Student Roll No:	Section No:

Instructions:

READ carefully the following instructions before attempting the paper.

- The **Final Exam** consists of **seven** questions and **3 pages**. Be sure that you have all of these and that they are all legible.
- Write your **roll number**, **section** accompanied by your **signature** on each page. Each page should be numbered in sequence.
- Don't share your work, if your submission is matched to any member of your class, both will be marked 0 straight without asking who shared or who magically copied.
- You have to "ATTEMPT ON Paper".
- In case of non-availability of internet due to load shedding etc, mobile data should be good enough to download and upload files. You do not need the internet during 3 hour offline exams. So better, fully charge your mobile battery and ready to upload data using mobile in case of emergency.
- **180 minutes** is for an exam to attempt, **30 minutes** for pdf formation and submission on LMS (Google Classroom). If you find some problem with LMS, don't waste your time and email your theory teacher with the subject: **FINAL_DB**. Also submit the same later to LMS as well. First submission will be accepted only.
- Email Address is: **tania.iram@nu.edu.pk**
- Submissions after **12:30 pm** are considered **late**. There is a **penalty** for late submission i.e **deduction of 5 points for 10 minutes** late submission.

Time: 180 minutes (to attempt) + 30 minutes (to submit)

weightage: 50

Question 1.

Time:25 minutes, [Points:10]

Lucky One Computer Sale society maintains data about the computer accessory shops, salesmen, customers and suppliers involved in business. Important points to consider are:

- There are many shops with distinct ids and names which stock computer accessories . There are, small, medium and large shops at different floors.
- Stocked accessories have unique number, name, model, price and supplier id.
- One supplier can supply various stocked accessories, one stocked accessory can be supplied by various suppliers.
- Every day, different items from stocked accessories are on sale to customers.
- Each shop has at least one salesman, large shops can have 5 salesmen.
- On sale of each item, a receipt is generated after asking customer CNIC, name, address, contact number, email address. Customer data is maintained for sending discounted offers through

email and sms. Sale receipt contains actual price, discounted price, warranty period and sales date.

- On each sale, salesman earns 5% commission.

Design an ERD for the above scenario with proper structural constraints and cardinality identified.

Question 2.

Time:30 minutes, [Points:10]

Consider a relational table of a production house:

Director (director_name, director_id, director_office_id, actor_id, actor_name, actor_office_id, actor designated coffee machine id, Coffee machine owner id, coffee machine id, machine_capacity, P.A_name, P.A_id, P.A_office)

Schema has the following characteristics:

- Directors and P.As have individual offices, actors share offices.
 - Actors can work for multiple directors.
 - Each coffee machine is owned by one director.
 - Each director can own multiple coffee machines.
 - Actors can only use one coffee machine.
 - The coffee machine the actor uses must be owned by one of the directors they work for.
 - P.As can work for multiple directors.
 - Each Directors only have a single P.A.
- a) Identify one or more explicit constraints that cannot be fulfilled in the schema design and also describe how they can be imposed by the DBA explicitly
- b) Decompose this table and normalize up to 3NF; Underline keys in the newly created tables.
- c) Designate foreign keys by drawing an arrow from a foreign key to the primary key it refers to.

Question3.

Time:10 minutes, [Points:5]

Draw the layered architecture of your submitted database project labeling different components at each level.

Question 4.

Time:20 minutes, [Points:9]

Consider the following schema:

Pharmacist (ph_id, ph_name, address)

Medicine (med_id, med_name, strength_in_mg)

Sales (ph_id, med_id, cost, date)

The key fields of all three tables are underlined . Sales table has a composite primary key and lists the prices charged for medicine by pharmacist. Write the following queries in **relational algebra** and Oracle **SQL Plus**:

1. Find the names of medicines sold on the same date by at least by two different Pharmacists.
2. Find the med_ids of the cheapest medicine sold by Pharmacist 'Ahmed' in 'Ayesha Manzil'.
3. Find the ids and names of pharmacists who sold 'Panadol' and 'Azithromycin'.

Question 5.

Time:15 minutes, [Points:6]

Draw the serializability (precedence) graphs for following Schedules, and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s).

S₁: r1(a) r1(b) w2(a) w1(a) r2(b) r3(c)

S₂: r1(a) r3(b) w1(a) w2(b) r3(a) w2(b)

Question 6.

Time:25 minutes, [Points:4]

Two passengers Ahsan and Bashir try to book executive class Air Conditioned(A.C.) sleeper in Business train from Karachi to Rawalpindi using online railway portal at the same time. There is only one executive class A.C. sleeper in business train. Write an algorithm using shared lock and exclusive lock for avoiding the booking conflicts between Ahsan and Bashir and avoid the system resulting in executive A.C. sleeper booking status having inconsistent value. In the meantime if one of them want to book another regular lower AC seats then he can do it.

Question7.

Time:25 minutes, [Points:6]

The following table corresponds to four transactions T1, T2, T3, and T4 running concurrently before crash. Suppose that we use the immediate update protocol with check pointing. Describe the recovery process from the system crash.

- Specify which transactions will roll back,
- which operations will need redo and which (if any) need undo,
- Identify any cascading rollback if occurs.
- Initial values of variables before this table snapshot are W=10, X=50, Y=50,Z=5

T1	T2	T3	T4
R(W) R(Z) Z=Z+5 COMMIT			
	R(X) X=X+6 W(X)		
			R(Z) Z=Z-10
		R(Y) Y=Y+10	
			R(W) W=W-10 COMMIT
	R(Z) Z=Z+10		

System Crash

**Best of Luck!**