

Quiz 03

Database Systems (CS 203)

Dated: _____ Roll Number: _____ Sec: _____

Note: Total weightage is **2.5**. Time allowed is 40 minutes. Do not cheat.

Question #01: A software house generates the project management report for each project as shown in the figure 01.

Project Management Report

Project Code: PC010
Project Title: Pensions System

Project Manager: M Phillips
Project Budget: £24,500

Employee No.	Employee Name	Department No.	Department Name	Hourly Rate
S10001	A Smith	L004	IT	£22.00
S10030	L Jones	L023	Pensions	£18.50
S21010	P Lewis	L004	IT	£21.00
S00232	R Smith	L003	Programming	£26.00
Total Staff on Project: 4				Average Hourly Rate: £21.88

Calculated Fields

Figure 01: Project Management Report

And the data of multiple project reports has been shown in figure 02. Your task is to check if the data given in figure 02 is susceptible to anomalies? If yes, then resolve the anomalies step by step using normalization (up to 3NF). Clearly define Functional Dependencies. In case of any ambiguity you may make assumptions, but your assumptions should be valid with respect to given scenario.

Project Code	Project Title	Project Manager	Project Budget	Employee No.	Employee Name	Department No.	Department Name	Hourly Rate
PC010	Pensions System	M Phillips	24500	S10001	A Smith	L004	IT	22.00
PC010	Pensions System	M Phillips	24500	S10030	L Jones	L023	Pensions	18.50
PC010	Pensions System	M Phillips	24500	S21010	P Lewis	L004	IT	21.00
PC045	Salaries System	H Martin	17400	S10010	B Jones	L004	IT	21.75
PC045	Salaries System	H Martin	17400	S10001	A Smith	L004	IT	18.00
PC045	Salaries System	H Martin	17400	S31002	T Gilbert	L028	Database	25.50
PC045	Salaries System	H Martin	17400	S13210	W Richards	L008	Salary	17.00
PC064	HR System	K Lewis	12250	S31002	T Gilbert	L028	Database	23.25
PC064	HR System	K Lewis	12250	S21010	P Lewis	L004	IT	17.50
PC064	HR System	K Lewis	12250	S10034	B James	L009	HR	16.50

Figure 02: Multiple Project Reports

Question #02: Consider a database with the following schema:

Person (name, age, gender) name is a key

Frequents (name, pizzeria) (name, pizzeria) is a key

Eats (name, pizza) (name, pizza) is a key

Serves (pizzeria, pizza, price) (pizzeria, pizza) is a key

Write relational algebra expressions for the following four queries.

- Find all pizzerias frequented by at least one person under the age of 18
- Find the names of all females who eat both mushroom and pepperoni pizza.
- Find all pizzerias that serve at least one pizza that Amy eats for less than \$10.00.
- Find the names of all people who frequent only pizzerias serving at least one pizza they eat.

Good Luck :)

Solution 02 a: $\pi_{pizzeria}(\sigma_{age < 18}(Person) \bowtie Frequent)$

b: $\pi_{name}(\sigma_{gender='female' \wedge pizza='mushroom'}(Person \bowtie Eats)) \cap \pi_{name}(\sigma_{gender='female' \wedge pizza='pepperoni'}(Person \bowtie Eats))$

c: $\pi_{pizzeria}(\sigma_{name='Amy'}(Eats) \bowtie \sigma_{price < 10}(Serves))$

d: $\pi_{name}(Person) - \pi_{name}(Frequent - \pi_{name.pizzeria}(Eats \bowtie Serves))$

Solution 01A:

Emp. Dept

Project code	P.title	P.Mngr	P.Budget	E.No	E.Name	D.No	D.Name	Hourly Rate
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Solution
 Given Relation is not in 2NF. As there is a nested relation
 Nested Relation Solution \Rightarrow Decomposition

After 1NF

Project Code	P.title	P.Mngr	P.Budget
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\uparrow FD1

R₁

Project code	E.No	E.Name	D.No	D.Name	Hourly Rate
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\uparrow FD2
 \uparrow FD3
 \uparrow FD4

FD1 and FD2 are upto 3NF.
 FD3 has partial Dependency. Therefore solve FD3 first.

Project code	E.No	Hourly Rate
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\uparrow FD2

R₂

E.No	E.Name	D.No	D.Name
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\uparrow FD3
 \uparrow FD4

FD3 Resolved, FD4 has transitive dependency.

E.No	E.Name	D.No
------	--------	------

\uparrow FD3

R₃

D.No	D.Name
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\uparrow FD4

R₄

Final Relations upto 3NF are R₁, R₂, R₃, and R₄.

Solution 01B:

