**Instructions**

When writing a query, write the query in a way that it would work over all possible database instances and not just for the given example instance!

Consider the following database schema and example instance for the book database. Good luck!!! Exam time is 60 mins

This exam is open notes and open book. Please fill your **name** and sign the statement below.

I will work on my own on the exam and I will not share my answers or discuss it with anyone even after completing the exam.

Signature

|  |  |
| --- | --- |
| **Writer** | **Publisher** |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **wId** | **Name** | **gender** | **DOB** | **penName** | | 152 | John | M | 1924 | George | | 26 | Sam | F | 1932 | FanM | | 352 | Alice | F | 1940 | Alen | | |  |  |  | | --- | --- | --- | | **ABN** | **Name** | **Address** | | 1234 | wiley | 12 fany st | | 1235 | kobo | 15 Johnson ave | | 54134 | Dsp | 100 newton st | |
| **Writes** | **Editor** |
| |  |  |  | | --- | --- | --- | | **ISBN** | **wId** | **date** | | 64 | 152 | 2009 | | 75 | 26 | 2012 | | 4 | 352 | 2017 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | **TFN** | **Name** | **Address** | **salary** | **ABN** | | 1 | Sam | 5 19th St | 75000 | 1234 | | 2 | Paul | 6 oak St | 80000 | 1235 | | 3 | Tim | 85 4th St | 72000 | 54134 | |

**Book:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ISBN** | **title** | **edition** | **price** | **ABN** | **TFN** | **type** |
| 64 | CalculusI | 1 | 120 | 2 | 1234 | Math |
| 75 | Database design | 2 | 55 | 1 | 1235 | CS |
| 4 | Java Illuminate | 4 | 130 | 3 | 54134 | CS |

Relational Algebra (total 12.5 points)

Question I.1 (2.5 Points) Write a relational algebra expression that returns the book titles published by wiley.

πtitle (σ Publisher.Name= 'wiley' (Book ⋈ Publisher))

Question I. 2 (3.5 Points) Write a relational algebra expression that returns the number of editors that work for kobo and make more than 60000.

Gcount(Editor.TFN)(σ Publisher.Name= ' kobo' ∧ Editor.salary>60000 (Editor ⋈ Publisher))

Since the selection (σ) eliminates all other publisher, grouping was not required. If selection was not use performed first than grouping is required­

Πcount(TFN) σ Publisher.Name= ' kobo' ( ABN Gcount(Editor.TFN)( σ Editor.salary>60000 Editor) ⋈ Publisher))

Question I.3 (3 Points) Write a relational algebra expression that returns the name of the writers that never published a book

πName(πwid Writer – πwid Writes⋈Writer⋈Book) ⋈ Writer

Question I.4 (3.5 points) Write a relational algebra expression that returns the penname of writers, that wrote (co-authored) all the math type books

πWriter.penName((Writes ÷ πWiud σBook.type='Math' Book) ⋈ Writer)

# SQL (5 points)

II.1 (3 points) Write an SQL statement that creates a new relation **Reader** that records information about book readers. The readers are uniquely identified by r\_id, the relation includes the favorite writer id (w\_id), name and address, DOB. Ensure that the name is a required field (never left blank) ant that the DOB is after 1900. If a favorite writer is removed from the writer table is w\_id is set to null.

create table Reader(

r\_id varchar(20) primary key,

favorite\_w\_id int,

name varchar(20) not null,

address varchar(30),

DOB int check(DOB> 1900),

foreign key (favorite\_w\_id) references writer(wId) on delete set null);

Question II-2 (2 Points) Write an SQL statement that returns the minimum salary paid by each publisher

select ABN, min(salary) as min\_salary

from Editor join Publisher

group by ABN;

# ER\_diagram (7.5 points)

III. 1 ( 4.5 points) Create an ER diagram for a clinic management that includes:

An employee entity identified by eid and have a salary, job type as attributes.

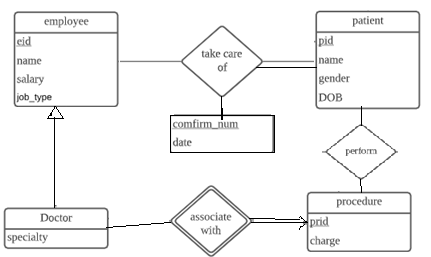
A patient entity identified by pid, having a name, gender and DOB as attributes.

The doctor entity, where doctor is an employee that has a specialty.

A procedure entity is associated with a doctor, that has a discriminator prid and has a charge attribute.

One or more employees take care of patients during their visit. Each visit has a date and confirmation number .

Doctor performs some procedure on some patients.



Question III-2 (3 points) Reduce the ER diagram using the reduction rules to get the schema for the clinic system. State the rules used.

Strong Entities

Employee(eid, name, salary, job\_type)

Patient(pid, name, gender, DOB)

Weak Entities

Relationships one-to-one

NA

Relationships many-to-many

Take\_care\_of(eid, pid, confirm\_num, date)

Perform (pid, eid, prid)

ISA generalization

Doctor(eid, specialty)