Prev Year University Questions on Relational Algebra

The relational schema for a library describing members, books and issue information is given below. Foreign keys have the same name as primary keys.

BOOKS(ACC-NO, ISBN, TITLE, EDITION, YEAR)

MEMBERS(MEMBERID, MEMBERNAME, MEMBERTYPE)

ISSUEDTO(ACC-NO, MEMBERID, DATE OF ISSUE)

Write relational algebra expressions for the following queries:

a) Accession Number(s) and Name(s) of third edition books published in 2018. (2)

b) Names and dates of issue of books taken by a member with name 'PRIYA'. (3)

c) Names of books *not* taken by any member. (4)

(a)

$$\Pi_{name,\ AccNo}\left(\sigma_{Edition='3'\ AND\ Year='2018'}(Book)\right)$$

(b)

$$A \leftarrow \sigma_{Membername='PRIYA'}(Members)$$

$$B \leftarrow A \bowtie_{A.memberid = Issuedto.memberid} Issuedto$$

$$C \leftarrow B \bowtie_{B.AccNo = Books.AccNo} Books$$

$$Result \leftarrow \Pi_{Title,\ date\ of\ issue}(C)$$

(c)

$$A \leftarrow \Pi_{AccNO}(Book)$$ { Acc No. of Entire books }

$$B \leftarrow \Pi_{AccNO}(ISSUED\ TO)$$ { Acc No of Issued books }

$$C \leftarrow A - B$$

$$\Pi_{title}\left(C \bowtie_{C.AccNo = Books.AccNo} Books\right)$$

Study the tables given below and write relational algebra expressions for the queries that follow. (9)

STUDENT(ROLLNO, NAME, AGE, GENDER, ADDRESS, ADVISOR)
COURSE(COURSEID, CNAME, CREDITS)
PROFESSOR(PROFID,PNAME, PHONE)
ENROLLMENT(ROLLNO, COURSEID, GRADE)

Primary keys are underlined. ADVISOR is a foreign key referring to PROFESSOR table. ROLLNO and COURSEID in ENROLLMENT are also foreign keys referring to THE primary keys with the same name.

(i) Names of female students
(ii) Names of male students along with adviser name
(iii) Roll Number and name of students who have not enrolled for any course.

Soln

(a) $\Pi_{name}\left(\sigma_{gender='Female'}(Student)\right)$

(b)
$A \leftarrow \sigma_{gender='male'}(Student)$

$B \leftarrow A \bowtie_{advisor = Profid} Professor$

$Result \leftarrow \Pi_{name,\ pname}(B)$

(c)
$A \leftarrow \Pi_{rollno}(student)$

$B \leftarrow \Pi_{rollno}(Enrollment)$

$C \leftarrow A - B$

$D \leftarrow C \bowtie_{C.rollno = Student.rollno} Student$

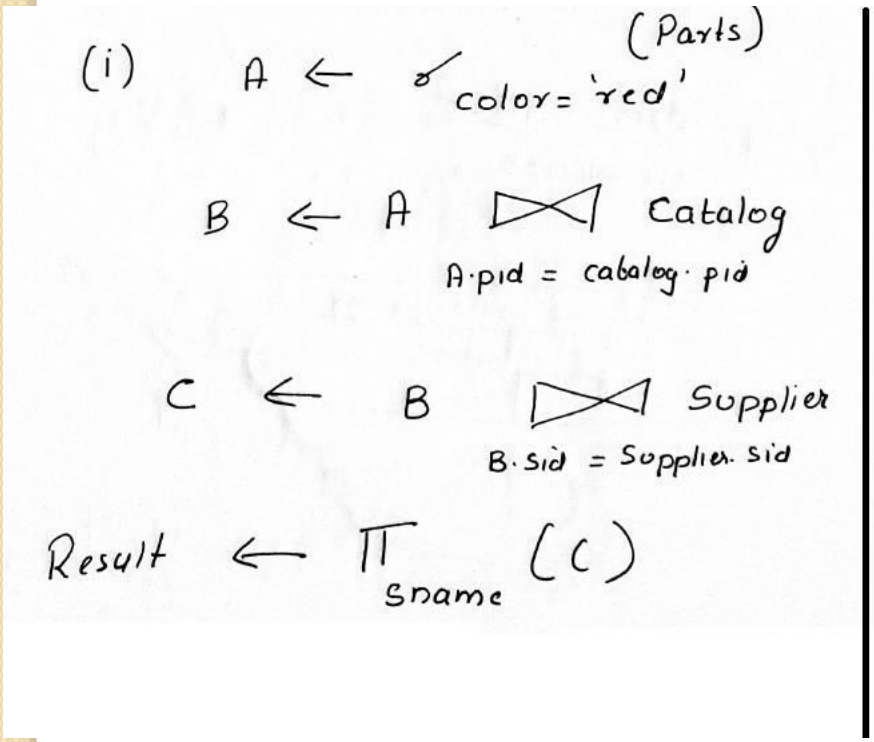
$Result \leftarrow \Pi_{rollno,\ name}(C)$

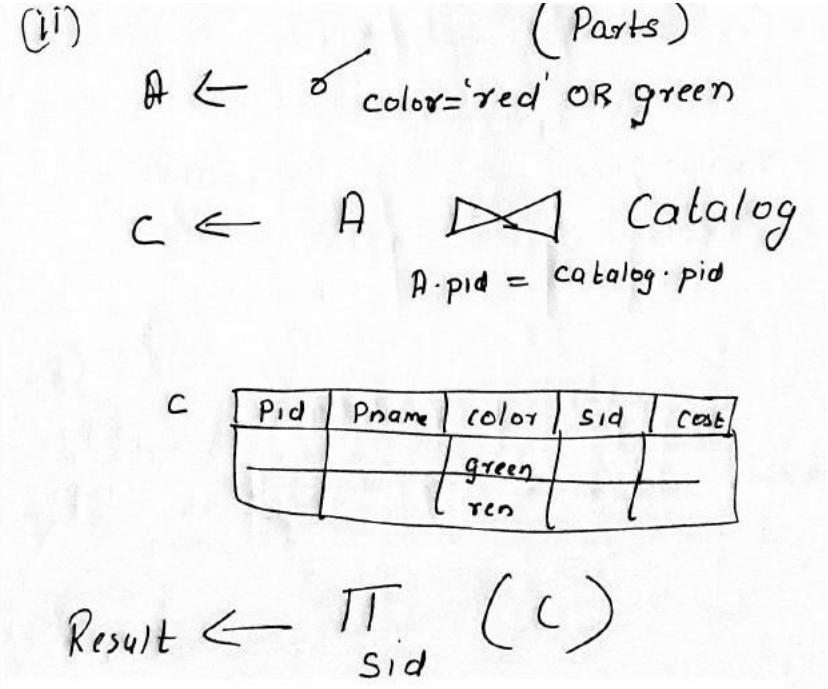
Consider the following database with primary keys underlined

Suppliers (sid, sname, address)
Parts (pid, pname, color)
Catalog (sid, pid, cost)

sid is the key for Suppliers, pid is the key for Parts, and sid and pid together form the key for Catalog. The Catalog relation lists the prices charged for parts by Suppliers.

Write relational algebra for the following queries: -
i) Find then names of suppliers who supply some red part
ii) Find the sid's of suppliers who supply some red or green part
iii) Find the sid's of suppliers who supply some red part and some green part.





(iii)

$A \leftarrow \sigma_{color = 'Red' \text{ AND } 'Green'}$ (Parts)

A

Pid	Pname	color
		Red
		Green

$B \leftarrow A \bowtie$ catalog

$A.pid = catalog.pid$

B

Pid	Pname	color	sid	cost

$Result \leftarrow \Pi_{sid}$ (B)

The relational database schema below represents certain information about albums, songs in the albums and singers of those songs. Foreign keys are given the *same* name as primary keys for easy identification. (9)

ALBUMS(ALBUM#, ALBUM-NAME, PRODUCED-BY, YEAR)
SONGS(SONG#, SONG-START, DURATION, ALBUM#)
SUNGBY(ARITISTNAME, SONG#)

In the context of the schema, write relational algebra expressions for the following queries:

(a) Names of albums produced by 'HMV' in the year 2018. (b) Names of albums in which an artist with name, 'AVANTHIKA' sung. (c) Names of albumsin which *all* the artists have sung songs.

(a)

$$\Pi_{\text{Album name}}\left(\sigma_{\text{year} = 2018 \text{ AND produced by} = \text{'HMV'}}(\text{Albums})\right)$$

(b)

$$A \leftarrow \sigma_{\text{Artist name} = \text{'AVANTHIKA'}}(\text{Sung by})$$

A ⇒

Artist Name	Sogn#
Avonthika	—

$$B \leftarrow A \bowtie_{A.\text{Song\#} = \text{Song.Song\#}} \text{Songs}$$

B

Song#	Song start	duration	Album#	Artist name

$$C \leftarrow B \bowtie_{B.\text{Album\#} = \text{Albums.Album\#}} \text{Albums}$$

$$\text{Result} \leftarrow \Pi_{\text{Album name}}(C)$$

(c)

$$A \leftarrow \text{Sung by} \bowtie_{\text{Sung by.Song\#} = \text{Songs.Song\#}} \text{Songs}$$

A

Song#	Song start	duration	Album#	Artist name

$$B \leftarrow A \bowtie_{A.\text{Album\#} = \text{Albums.Album\#}} \text{Albums}$$

B

Album#	Album name	Prod by	year	Song#	Song start	duration	Artist name

$$\text{Result} \leftarrow \Pi_{\text{albumname}}(B)$$

Q) Consider the query

"Select Name, Age from Student Where Gender = 'Male'" on the table Student (Rollno, Name, Age, Gender, Address). Give a relational algebra expression corresponding to the query

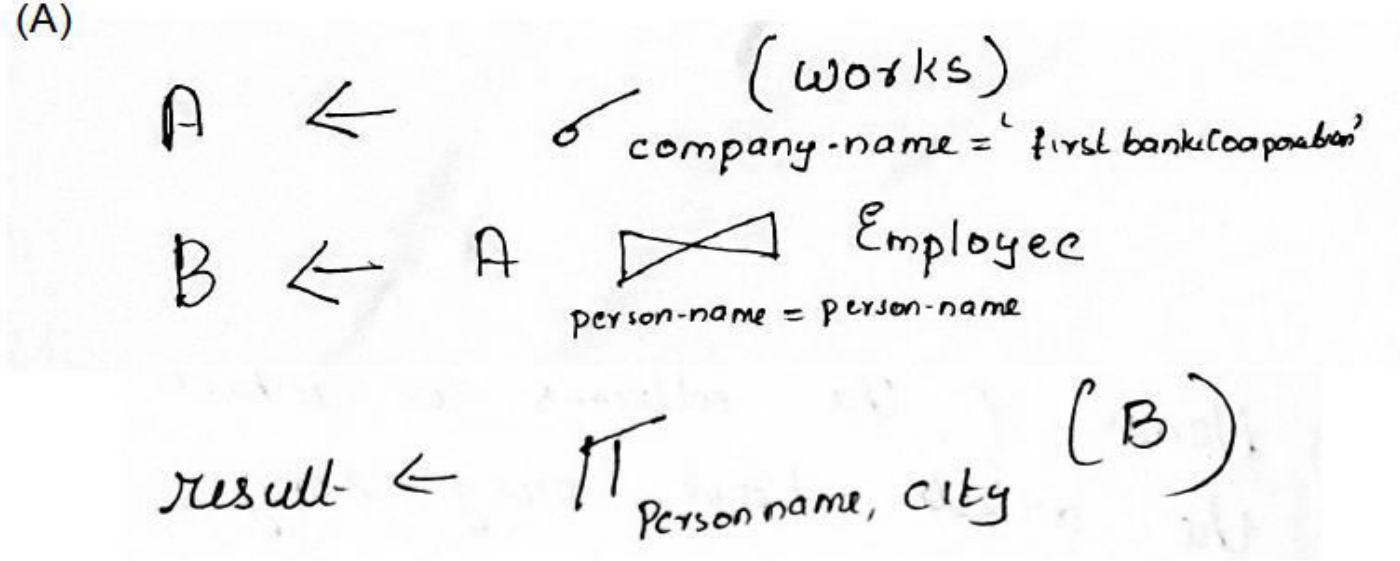
$$\Pi_{name,\ age}\left(\sigma_{gender='male'}(Student)\right)$$

Consider the schema given below.

employee (person-name, street, city)
works (person-name, company-name, salary)
company (company-name, city)
manages (person-name, manager-name)

Write relational algebra queries for the following questions
a. Find the names and cities of residence of all employees who work for First Bank Corporation.
b. Find the names, street address, and cities of residence of all employees who work for First Bank Corporation and earn more than $10,000 per annum.
c. Find the names of all employees in this database who live in the same city as the company for which they work.

(A)



(B)

$A \leftarrow \sigma_{\text{company-name} = \text{'firstbank Coorperation'} \text{ AND } \text{Salary} > \$10,000}(\text{works})$

$B \leftarrow A \bowtie_{\text{person-name} = \text{person-name}} \text{Employee}$

$\text{Result} \leftarrow \Pi_{\text{personname, street, city}}(B)$

(C)

$A \leftarrow \text{Employee} \bowtie_{\text{city} = \text{city}} \text{Company}$

$\text{result} \leftarrow \Pi_{\text{person.name}}(A)$