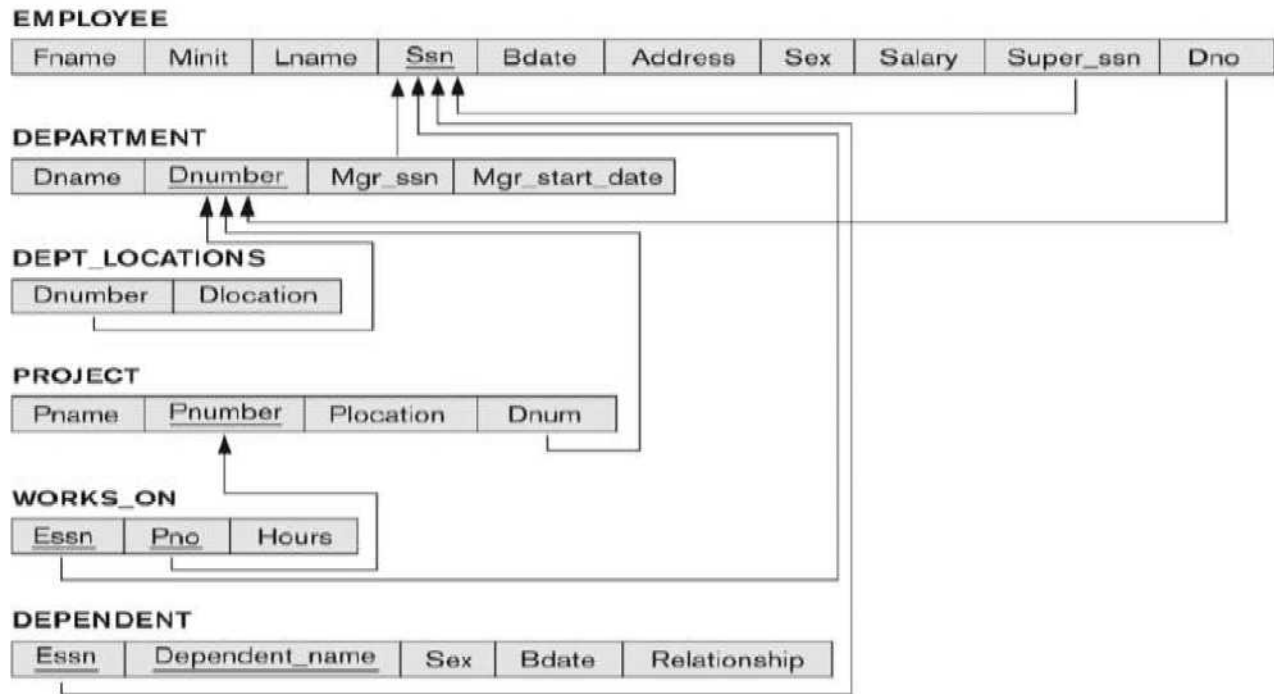


Relational Algebra Exercise

Consider the COMPANY relational database schema:



Specify the following queries using the relational algebra operators, and also show the result of each query as it would apply to the database state in page 2.

- Retrieve the name, birth date and address of the employee(s) whose name is "John B. Smith"

$$\Pi_{\text{Fname, Minit, Lname, Address, Birthday}} (\sigma_{\text{Fname} = \text{'John'} \cap \text{Minit} = \text{'B'} \cap \text{Lname} = \text{'Smith'}} (\text{EMPLOYEE}))$$

- Retrieve the names of all employees in the department whose name is Administration

$$\Pi_{\text{Fname, minit, Lname}} (\sigma_{\text{DNAME} = \text{'Administration'}} ((\text{EMPLOYEE}) \bowtie_{\text{DNO}=\text{DNUMBER}} (\text{DEPARTMENT})))$$

- Retrieve the names of all employees in the departments which are located in Houston

$$\Pi_{\text{Fname, minit, Lname}} (\sigma_{\text{DLOCATION} = \text{'Houston'}} ((\text{EMPLOYEE}) \bowtie_{\text{DNO}=\text{DNUMBER}} (\text{DEPARTMENT})))$$

- List the names of all employees who have a dependent with the same

first name as themselves

$$\Pi_{Fname, minit, Lname} ((EMPLOYEE) \bowtie_{(Fname = Dependent_name)} \cap_{(Ssn = Essn)} (DEPENDENT))$$

- e. For each project, calculate the total number of employees who work for it, and the total number of hours that these employees work for the project.

- f. Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductX project.
- g. For each employee, retrieve the employee's first name and last name and the first and last name of his/her immediate supervisor.

- h. Retrieve the average salary of all female employees.
- i. For each department whose average employee salary is more than \$30.000, retrieve the department name and the number of employees work for that department.
- j. Retrieve all employee's names directly managed by the manager of the department "Research."
- k. Retrieve names, department number, and salaries of those employees who have the highest salary in each department.

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1 955'1	533 Voss, Houston, TX	M	40000	338665555	5
Alic la	J	Zelaya	999097777	1960-01-1 9	3321 Castle, Spring, TX	F	25000	907654321	4
Jen niter	S	Wallace	907654321	1941'06-20	291 Berry, Bellaire. TX	F	43000	008665555	4
RarTieHh	K	Narayan	666884444	1962-09-1 5	976 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	26000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987664321	4
James	E	Berg	089665555	1937'11'10	46Q Stone, Houston, TX	M	5500Q	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1 580-05-22
Administration	4	987654321	1 995-01-01
Headquarters	1	888665666	1 981-06-1 9

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Essn	Pno	Hours
123456709	1	32,5
123456789	2	7.5
666804444	3	40.0
463463463	1	20,0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445665	10	10,0
333445555	20	10,0
9^9597777	30	30.0
999687777	1 0	1 0.0
987987987	10	35.0
987987987	30	6.0
95765^321	30	ao.o
987654321	20	1 5.0
888665555	20	NULL

PROJECT

Pname	Pnumber	Plocation	Dnum
PrductX	1	Bellaire	5
ProductY	2	Sugarland	6
PrOducitZ	3	Houston	6
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPENDENT

Essn	Dependent name	Sex	Bdate	Relationship
333445555	Alice	E	1 986-04-05	Daughter
333445555	Theodore	M	1 903'1 0'25	Son
333445556	Joy	F	1 958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123406709	Wichsel	M	1999-01-04	Son
123456709	Alice	F	1 988-1 2-30	Daughter
123456739	Elizabeth	F	1 967-05-05	Spouse