Company Database Queries

Q1 Retrieve the names and address of all employees who work for the *Research* department.

$RESEARCH\_DEPT = \sigma_{DNAME="Research"}(DEPARTMENT)$
$RESEARCH\_DEPT\_EMPS = (RESEARCH\_DEPT \bowtie_{DNUMBER=DNO} EMPLOYEE)$
$RESULT = \Pi_{FNAME,LNAME,ADDRESS}(RESEARCH\_DEPT\_EMPS)$

Q2 For every project located in *Stafford*, list the project number, the controlling department number, and the department manager's last name, address and birthdate.

$STAFFORD\_PROJS = \sigma_{PLOCATION="Stafford"}(PROJECT)$
$CONTR\_DEPT = (STAFFORD\_PROJS \bowtie_{DNUM=DNUMBER} DEPARTMENT)$
$PROJ\_DEPT\_MGR = (CONTR\_DEPT \bowtie_{MGRSSN=SSN} EMPLOYEE)$
$RESULT = \Pi_{PNUMBER,DNUM,LNAME,ADDRESS,BDATE}(PROJ\_DEPT\_MGR)$

Q3 Find the names of employees who work on **ALL** the projects controlled by department number 5.

$DEPT5\_PROJS = \Pi_{PNUMBER}(\sigma_{DNUM=5}(PROJECT))(PNO)$
$EMP\_PROJ = \Pi_{ESSN,PNO}(WORKS\_ON)(SSN, PNO)$
$RESULT\_EMP\_SSNS = EMP\_PROJ \div DEPT5\_PROJS$
$RESULT = \Pi_{LNAME,FNAME}(RESULT\_EMP\_SSNS \bowtie EMPLOYEE)$

Q4 Make a list of project numbers for projects that involve an employee whose last name is $Smith$, either as a worker or as a manager of the department that controls the project.

$SMITHS = \Pi_{SSN}(\sigma_{LNAME="Smith"}(EMPLOYEE))(ESSN)$
$SMITH\_WORKER\_PROJS = \Pi_{PNO}(WORKS\_ON \bowtie SMITHS)$
$MGRS = \Pi_{LNAME,DNUMBER}(EMPLOYEE \bowtie_{SSN=MGRSSN} DEPARTMENT)$
$SMITH\_MGRS = \sigma_{LNAME="Smith"}(MGRS)$
$SMITH\_MANAGED\_DEPTS = \Pi_{DNUMBER}(SMITH\_MGRS)(DNUM)$
$SMITH\_MANAGED\_PROJS = \Pi_{PNUMBER}(SMITH\_MANAGED\_DEPTS \bowtie PROJECT)(PNO)$
$RESULT = SMITH\_WORKER\_PROJS \cup SMITH\_MGR\_PROJS$

Q5 List the names of employees with two or more dependents.

$TEMP1 = \Pi_{ESSN,DEPENDENT\_NAME}(DEPENDENT)(SSN1, DNAME1)$
$TEMP2 = \Pi_{ESSN,DEPENDENT\_NAME}(DEPENDENT)(SSN2, DNAME2)$
$RESULT\_SSNS = \Pi_{SSN1}(TEMP1 \bowtie_{SSN1=SSN2 \text{ and } DNAME1<>DNAME2} TEMP2)$
$RESULT = \Pi_{LNAME,FNAME}(RESULT\_SSNS \bowtie EMPLOYEE)$

Q6 Retrieve the names of employees who have no dependents.

$ALL\_EMPS = \Pi_{SSN}(EMPLOYEE)$
$EMP\_WITH\_DEPS = \Pi_{ESSN}(DEPENDENT)(SSN)$
$EMP\_WITHOUT\_DEPS = ALL_EMPS - EMPS\_WITH\_DEPS$
$RESULT = \Pi_{LNAME,FNAME}(EMPS\_WITHOUT\_DEPS \bowtie EMPLOYEE)$

Q7 List the names of managers who have at least one dependent.

$$MGRS = \Pi_{MGRSSN}(DEPARTMENT)(SSN)$$
$$EMPS\_WITH\_DEPS = \Pi_{ESSN}(DEPENDENT)(SSN)$$
$$MGRS\_WITH\_DEPS = MGRS \cap EMPS\_WITH\_DEPS$$
$$RESULT = \Pi_{LNAME,FNAME}(MGRS\_WITH\_DEPS \bowtie EMPLOYEE)$$