1. Consider the following relations:

Student(*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)

Class(*name:* string, *meets at:* string, *room:* string, *fid:* integer)

Enrolled(*snum:* integer, *cname:* string)

Faculty(*fid*: integer, *fname:* string, *deptid:* integer)

The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class.

Write the following queries in SQL. No duplicates should be printed in any of the answers.

1. Find the names of all Juniors (level = JR) who are enrolled in a class taught by I. Teach.

2. Find the age of the oldest student who is either a History major or enrolled in a course taught by I. Teach.

3. Find the names of all classes that either meet in room R128 or have five or more students enrolled.

4. Find the names of all students who are enrolled in two classes that meet at the same time.

5. Find the names of faculty members who teach in every room in which some class is taught.

6. Find the names of faculty members for whom the combined enrollment of the

courses that they teach is less than five.

7. For each level, print the level and the average age of students for that level.

8. For all levels except JR, print the level and the average age of students for that level.

9. For each faculty member that has taught classes only in room R128, print the faculty member’s name and the total number of classes she or he has taught.

10. Find the names of students enrolled in the maximum number of classes.

11. Find the names of students not enrolled in any class.

12. For each age value that appears in Students, find the level value that appears most often. For example, if there are more FR level students aged 18 than SR, JR, or SO students aged 18, you should print the pair (18, FR).

The answers are given below:

1. SELECT DISTINCT S.Sname

FROM Student S, Class C, Enrolled E, Faculty F

WHERE S.snum = E.snum AND E.cname = C.name AND C.fid = F.fid AND

F.fname = ‘I.Teach’ AND S.level = ‘JR’

2. SELECT MAX(S.age)

FROM Student S

WHERE (S.major = ‘History’)

OR S.snum IN (SELECT E.snum

FROM Class C, Enrolled E, Faculty F

WHERE E.cname = C.name AND C.fid = F.fid

AND F.fname = ‘I.Teach’ )

3. SELECT C.name

FROM Class C

WHERE C.room = ‘R128’

OR C.name IN (SELECT E.cname

FROM Enrolled E

GROUP BY E.cname

HAVING COUNT (\*) *>*= 5)

4. SELECT DISTINCT S.sname

FROM Student S

WHERE S.snum IN (SELECT E1.snum

FROM Enrolled E1, Enrolled E2, Class C1, Class C2

WHERE E1.snum = E2.snum AND E1.cname *<>* E2.cname

AND E1.cname = C1.name

AND E2.cname = C2.name AND C1.meets at = C2.meets at)

5. SELECT DISTINCT F.fname

FROM Faculty F

WHERE NOT EXISTS (( SELECT \* FROM Class C )

EXCEPT

(SELECTC1.room FROM Class C1 WHERE C1.fid = F.fid ))

6. SELECT DISTINCT F.fname

FROM Faculty F

WHERE 5 *>* (SELECT COUNT (E.snum)

FROM Class C, Enrolled E

WHERE C.name = E.cname

AND C.fid = F.fid)

7. SELECT S.level, AVG(S.age)

FROM Student S

GROUP BY S.level

8. SELECT S.level, AVG(S.age)

FROM Student S

WHERE S.level <> ‘JR’

GROUP BY S.level

9. SELECT F.fname, COUNT(\*) AS CourseCount

FROM Faculty F, Class C

WHERE F.fid = C.fid

GROUP BY F.fid, F.fname

HAVING EVERY ( C.room = ‘R128’ )

10. SELECT DISTINCT S.sname

FROM Student S

WHERE S.snum IN (SELECT E.snum

FROM Enrolled E

GROUP BY E.snum

HAVING COUNT (\*) >= ALL (SELECT COUNT (\*)

FROM Enrolled E2

GROUP BY E2.snum ))

11. SELECT DISTINCT S.sname

FROM Student S

WHERE S.snum NOT IN (SELECT E.snum FROM Enrolled E )

12. SELECT S.age, S.level

FROM Student S

GROUP BY S.age, S.level,

HAVING S.level IN (SELECT S1.level

FROM Student S1

WHERE S1.age = S.age

GROUP BY S1.level, S1.age

HAVING COUNT (\*) >= ALL (SELECT COUNT (\*)

FROM Student S2

WHERE s1.age = S2.age

GROUP BY S2.level, S2.age))

2. Consider the following relational schema. An employee can work in more than one department; the *pct time* field of the Works relation shows the percentage of time that a given employee works in a given department.

Emp(*eid:* integer, *ename:* string, *age:* integer, *salary:* real)

Works(*eid:* integer, *did:* integer, *pct time:* integer)

Dept(*did:* integer, *dname:* string, *budget:* real, *managerid:* integer)

Write the following queries in SQL:

1. Print the names and ages of each employee who works in both the Hardware department and the Software department.

2. For each department with more than 20 full-time-equivalent employees (i.e., where the part-time and full-time employees add up to at least that many full-time employees), print the did together with the number of employees that work in that department.

3. Print the name of each employee whose salary exceeds the budget of all of the departments that he or she works in.

4. Find the managerids of managers who manage only departments with budgets greater than $1 million.

5. Find the enames of managers who manage the departments with the largest budgets.

6. If a manager manages more than one department, he or she controls the sum of all the budgets for those departments. Find the managerids of managers who control more than $5 million.

7. Find the managerids of managers who control the largest amounts.

8. Find the enames of managers who manage only departments with budgets larger than $1 million, but at least one department with budget less than $5 million.

create table student(

snum number(9,0) primary key,

sname varchar2(30),

major varchar2(25),

standing varchar2(2),

age number(3,0)

);

create table faculty(

fid number(9,0) primary key,

fname varchar2(30),

deptid number(2,0)

);

create table class(

name varchar2(40) primary key,

meets\_at varchar2(20),

room varchar2(10),

fid number(9,0),

foreign key(fid) references faculty

);

create table enrolled(

snum number(9,0),

cname varchar2(40),

primary key(snum,cname),

foreign key(snum) references student,

foreign key(cname) references class(name)

);

create table emp(

eid number(9,0) primary key,

ename varchar2(30),

age number(3,0),

salary number(10,2)

);

create table dept(

did number(2,0) primary key,

dname varchar2(20),

budget number(10,2),

managerid number(9,0),

foreign key(managerid) references emp(eid)

);

create table works(

eid number(9,0),

did number(2,0),

pct\_time number(3,0),

primary key(eid,did),

foreign key(eid) references emp,

foreign key(did) references dept

);

Student

051135593,Maria White,English,SR,21

060839453,Charles Harris,Architecture,SR,22

099354543,Susan Martin,Law,JR,20

112348546,Joseph Thompson,Computer Science,SO,19

115987938,Christopher Garcia,Computer Science,JR,20

132977562,Angela Martinez,History,SR,20

269734834,Thomas Robinson,Psychology,SO,18

280158572,Margaret Clark,Animal Science,FR,18

301221823,Juan Rodriguez,Psychology,JR,20

318548912,Dorthy Lewis,Finance,FR,18

320874981,Daniel Lee,Electrical Engineering,FR,17

322654189,Lisa Walker,Computer Science,SO,17

348121549,Paul Hall,Computer Science,JR,18

351565322,Nancy Allen,Accounting,JR,19

451519864,Mark Young,Finance,FR,18

455798411,Luis Hernandez,Electrical Engineering,FR,17

462156489,Donald King,Mechanical Engineering,SO,19

550156548,George Wright,Education,SR,21

552455318,Ana Lopez,Computer Engineering,SR,19

556784565,Kenneth Hill,Civil Engineering,SR,21

567354612,Karen Scott,Computer Engineering,FR,18

573284895,Steven Green,Kinesiology,SO,19

574489456,Betty Adams,Economics,JR,20

578875478,Edward Baker,Veterinary Medicine,SR,21

Class

Data Structures,MWF 10,R128,489456522

Database Systems,MWF 12:30-1:45,1320 DCL,142519864

Operating System Design,TuTh 12-1:20,20 AVW,489456522

Archaeology of the Incas,MWF 3-4:15,R128,248965255

Aviation Accident Investigation,TuTh 1-2:50,Q3,011564812

Air Quality Engineering,TuTh 10:30-11:45,R15,011564812

Introductory Latin,MWF 3-4:15,R12,248965255

American Political Parties,TuTh 2-3:15,20 AVW,619023588

Social Cognition,Tu 6:30-8:40,R15,159542516

Perception,MTuWTh 3,Q3,489221823

Multivariate Analysis,TuTh 2-3:15,R15,090873519

Patent Law,F 1-2:50,R128,090873519

Urban Economics,MWF 11,20 AVW,489221823

Organic Chemistry,TuTh 12:30-1:45,R12,489221823

Marketing Research,MW 10-11:15,1320 DCL,489221823

Seminar in American Art,M 4,R15,489221823

Orbital Mechanics,MWF 8,1320 DCL,011564812

Dairy Herd Management,TuTh 12:30-1:45,R128,356187925

Communication Networks,MW 9:30-10:45,20 AVW,141582651

Optical Electronics,TuTh 12:30-1:45,R15,254099823

Intoduction to Math,TuTh 8-9:30,R128,489221823

Enrolled

112348546,Database Systems

115987938,Database Systems

348121549,Database Systems

322654189,Database Systems

552455318,Database Systems

455798411,Operating System Design

552455318,Operating System Design

567354612,Operating System Design

112348546,Operating System Design

115987938,Operating System Design

322654189,Operating System Design

567354612,Data Structures

552455318,Communication Networks

455798411,Optical Electronics

301221823,Perception

301221823,Social Cognition

301221823,American Political Parties

556784565,Air Quality Engineering

099354543,Patent Law

574489456,Urban Economics

Faculty

142519864,Ivana Teach,20

242518965,James Smith,68

141582651,Mary Johnson,20

011564812,John Williams,68

254099823,Patricia Jones,68

356187925,Robert Brown,12

489456522,Linda Davis,20

287321212,Michael Miller,12

248965255,Barbara Wilson,12

159542516,William Moore,33

090873519,Elizabeth Taylor,11

486512566,David Anderson,20

619023588,Jennifer Thomas,11

489221823,Richard Jackson,33

548977562,Ulysses Teach,20

Emp

142519864,Susan Martin,39,56990

242518965,James Smith,68,27099

141582651,Mary Johnson,44,94011

011564812,John Williams,35,74098

254099823,Patricia Jones,28,42783

356187925,Robert Brown,28,35431

489456522,Linda Davis,26,25971

287321212,Michael Miller,62,131072

248965255,Barbara Wilson,48,95021

159542516,Matt Nelson,33,48990

090873519,Elizabeth Taylor,27,33055

486512566,David Anderson,20,25199

619023588,Jennifer Thomas,24,34654

112348546,Joseph Thompson,26,24998

115987938,Christopher Garcia,60,24998

132977562,Angela Martinez,31,24998

269734834,Rick Carter,38,24998

280158572,Margaret Clark,40,24998

301221823,Juan Rodriguez,30,32175

318548912,Ann Mitchell,23,32175

320874981,Daniel Lee,23,32175

322654189,Lisa Walker,38,32175

348121549,Trey Phillips,69,32175

351565322,Nancy Allen,30,39910

451519864,Mark Young,34,39910

455798411,Luis Hernandez,44,39910

550156548,George Wright,42,41008

552455318,Ana Lopez,35,41008

556784565,Kenneth Hill,81,41008

567354612,Karen Scott,70,39910

573284895,Steven Green,29,39910

574489456,Betty Adams,39,39910

015645489,Daniel Evans,25,40312

015487874,Gene Edwards,51,41008

054879887,Dorthy Lewis,33,41008

098784544,Eric Collins,23,41008

074454898,Scott Bell,23,70100

156489494,Gil Richardson,32,70100

179887498,Dorthy Howard,28,40312

156465461,Eric Cooper,26,24998

128778823,William Ward,33,24998

178949844,Chad Stewart,29,24998

298489484,Lisa Gray,31,24998

274878974,Harry Watson,30,24998

267894232,Paul Hall,25,24998

254898318,Gim Rogers,25,32175

489221823,Richard Jackson,33,32996

548977562,Donald King,43,92048

289562686,Thomas Robinson,34,32175

291795563,Haywood Kelly,36,32175

578875478,Edward Baker,50,101071

051135593,Maria White,22,24998

060839453,Charles Harris,24,24998

334568786,William Moore,32,32175

355548984,Tom Murphy,41,32175

310454876,Milo Brooks,22,39910

390487451,Mark Coleman,42,39910

454565232,Louis Jenkins,20,39910

141582657,Stanley Browne,23,14093

Works

142519864,2,100

242518965,1,100

141582651,1,50

141582651,5,50

141582657,1,25

141582657,5,75

011564812,3,100

254099823,3,100

356187925,2,100

489456522,7,100

287321212,2,100

248965255,3,100

159542516,4,100

090873519,2,100

486512566,4,100

619023588,1,100

489221823,2,100

548977562,4,100

578875478,6,100

051135593,2,100

060839453,2,100

112348546,2,100

115987938,2,100

132977562,2,100

269734834,2,100

280158572,2,100

301221823,2,100

318548912,2,100

320874981,2,100

322654189,2,100

348121549,2,100

351565322,2,100

451519864,2,100

455798411,2,100

550156548,2,50

552455318,2,25

556784565,2,25

567354612,2,75

573284895,2,50

574489456,2,50

015645489,6,100

015487874,6,100

054879887,6,100

098784544,6,100

074454898,6,100

156489494,6,100

179887498,6,100

156465461,6,100

128778823,6,100

178949844,6,100

298489484,6,100

274878974,6,100

267894232,6,100

254898318,6,100

289562686,6,100

291795563,6,100

334568786,6,100

355548984,6,100

310454876,6,100

390487451,6,100

454565232,6,50

Dept

1,Hardware,1048572.12,141582651

2,Operations,12099101.00,287321212

3,Legal,222988.13,248965255

4,Marketing,538099.54,548977562

5,Software,400011.12,141582651

6,Production,12099101.00,578875478

7,Shipping,5.00,489456522