23111-Cwk1-S-Database Design

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Conceptual Model in the Form of an EER diagram based on NASA’s DRS

PART 1A

In this part we had to use modelling software (I chose diagrams.net) to design a conceptual model in the form of an EER diagram. This is my short report describing a few of the more complicated design choices I decided to make.

BUILDING → weak entity

Weak entities have no assigned key → a partial key in participation with a strong entity. From the specification below I determined that building must be a weak entity, it is also the only weak entity in the EER diagram.

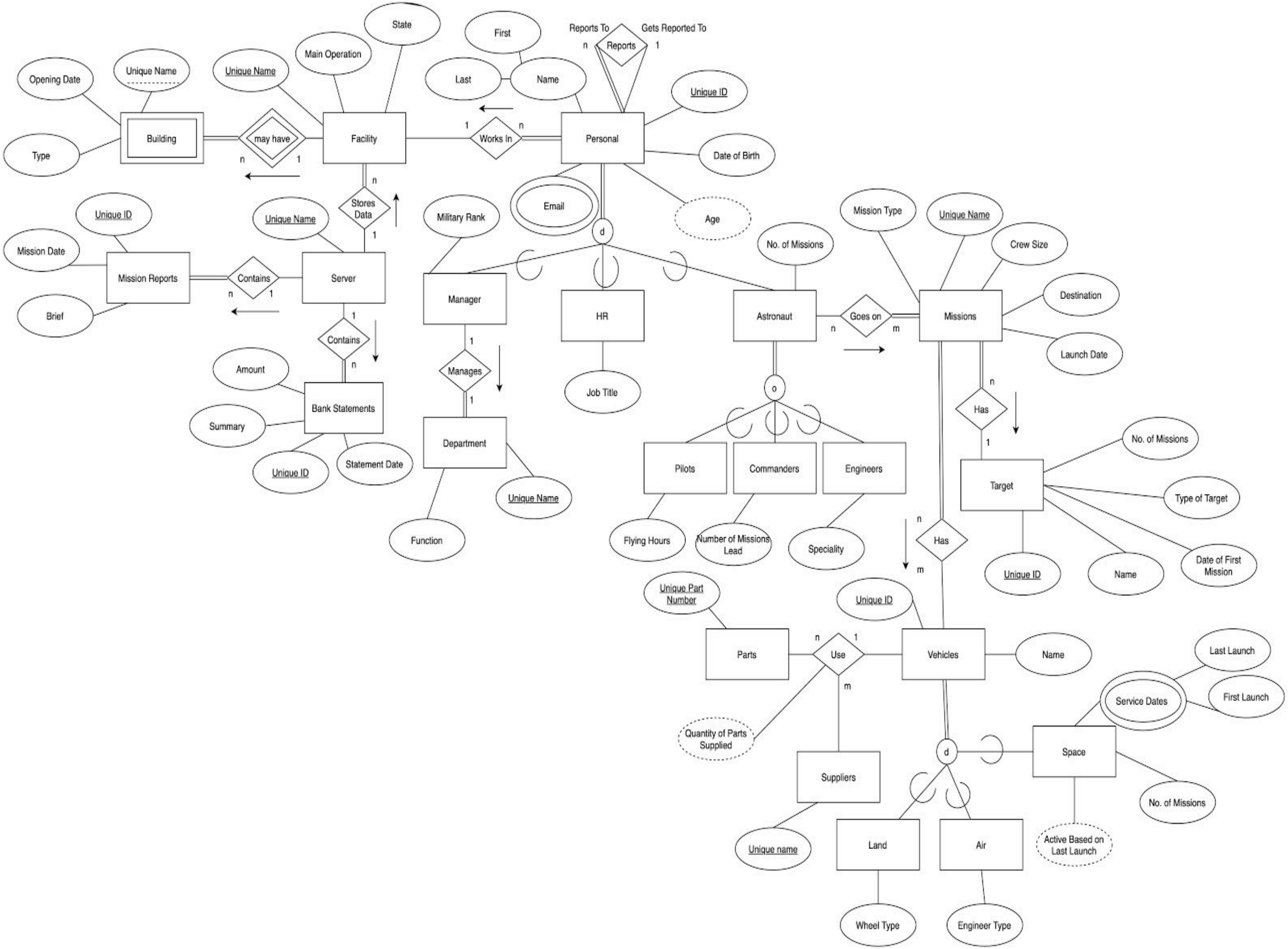
DRS clarification:
R17: Each facility may have many buildings or none, but each building must belong to one facility as the details of a building alone cannot identify it.
R18: A building has a name (identifier), type and opening date

PARTS, SUPPLIERS, VEHICLES → ternary relationship

This section links all 3 entities together (vehicle → supplier)(vehicle → parts)(supplier→ parts)(parts → supplier)(parts → vehicle)
As you can see this has to be a ternary relation, I decided to use the word ‘use’ for the relation as vehicle in this case. Logic as follows

- A vehicle can USE many parts
- A vehicle can USE many suppliers
- A supplier can USE parts to aid vehicle
- A supplier can be USED to get parts for vehicles
- Parts can be USED by a supplier to fix vehicle
- Parts can be USED to fix vehicle

DRS clarification:
R24: Each vehicle may use many parts from multiple suppliers. A supplier may access many parts and parts may come from many suppliers and go to many vehicles.


Opening Date
Unique Name
Type
Building
may have
n
1
Unique Name
Main Operation
State
Facility
1
Works In
n
First
Last
Name
Reports To
Reports
Gets Reported To
n
1
Unique ID
Personal
Date of Birth
Email
Age
n
Stores Data
1
Unique ID
Mission Date
Brief
Mission Reports
Contains
n
1
Unique Name
Server
1
Contains
n
Amount
Summary
Bank Statements
Unique ID
Statement Date
Military Rank
Manager
1
Manages
1
Department
Unique Name
Function
d
HR
Job Title
No. of Missions
Astronaut
n
Goes on
m
o
Pilots
Commanders
Engineers
Flying Hours
Number of Missions Lead
Speciality
Mission Type
Unique Name
Crew Size
Destination
Launch Date
Missions
n
Has
1
Target
No. of Missions
Type of Target
Unique ID
Name
Date of First Mission
n
Has
m
Unique Part Number
Parts
n
Use
1
m
Unique ID
Vehicles
Name
Quantity of Parts Supplied
Suppliers
Unique name
d
Land
Air
Wheel Type
Engineer Type
Service Dates
Last Launch
First Launch
Space
No. of Missions
Active Based on Last Launch

Constructing a Relational Schema from the EER diagram above

PART 1B

In this part we had to take our EER diagram created in part 1a, and map it to a relational schema. Like the report above I am going to describe more of the difficult choices I had to make.

BUILDING → weak entity
As the building was my only weak entity, I followed the convention described in step 2 of the relational schema mapping. Allowing all attributes from both the weak and its participating strong entity to be defined in the definition. Then the primary key consists of the unique identifiers from the weak and strong entity. Finally the foreign key mapping the strong identity’s key name to the actual one in the EER diagram. (facility_unique_name – > facility.unique_name)

PARTS, SUPPLIERS, VEHICLES → ternary relationship

As I had already recognised this as a ternary relationship, I just followed the conventional steps laid out in step 7 of relational schema mapping to produce the USE relation. All attributes (except derived) of the 3 entities are included in the definition, The primary key highlights the 3 unique identifiers for each entity and finally the foreign key links these 3 identifiers back to the exact name from the EER diagram.

NOTE

My diagram does not have underscores in the names however here I have linked with underscores for clarity. I don't have time to change my diagram.

```
Mission_Reports (unique_id, mission_date, brief,  server_id):
     pk [unique_id]
     fk [server_id – > server.unique_name]

Server (unique_name):
     pk [unique_name]

Bank_Statements (unique_id, statement_date, amount, summary,
server_id):
     pk [unique_id]
     fk [server_id – > server.unique_name]

Facility (unique_name, main_operation, state, server_id):
     pk [unique_name]
     fk [sever_id – > server.unique_name]

Personal (unique_id, date_of_birth, last_name, first_name,
facility_id, main_operation, state, personal_id):
     pk [unique_id]
     fk [facility_id – > facility.unique_name
          personal_id – > pesonal.unique_name]

Department (unique_name, function, personal._id):
     pk [unique_name]
     fk [personal_id – > personal.unique_id]

Missions (unique_name, mission_type, crew_size, destination,
launch_date, target_id, name, date_of_first_mission,
type_of_target, no._of_missions):
     pk [unique_name]
     fk [target_id – > target.unique_id]

Target (unique_id, name, date_of_first_mission,
type_of_target, no._of_missions):
     pk [unique_id]

Vehicles (unique_id, name):
     pk [unique_id]

Parts (unique_part_number):
     pk [unique_part_number]

Suppliers (unique_name):
     pk [unique_name]
```

```
Building (unique_name, opening_date, type,
facility_unique_name, main_operation, state):
     pk [unique_name, facility_unique_name]
     fk [facility_unique_name - > facility.unique_name]


Goes_On (mission_id, personal_id, no._of_missions,
mission_type, crew_size, destination, launch_date):
     pk [mission_id, personal_id]
     fk [mission_id - > missions.unique_name
               personal_id - > personal.unique_id]

Vehicle_Has ( mission_id, vehicle_id, mission_type, crew_size,
destination, launch_date, name):
     pk [mission_id, vehicle_id]
     fk [mission_id - > missions.unique_name
          vehicle_id - > vehicles.unique_id]

Personal_Email (email, personal_id):
     pk [email, personal_id]
     fk [personal_id - > personal.unique_id]

Service_Dates (service_dates, vehicle_id, first_launch,
last_launch):
     pk [service_dates, vehicle_id]
     fk [vehicle_id — > vehicle.unique_id]

Use (vehicle_id, parts_id, suppliers_id, name):
     pk [vehicle_id, parts_id, suppliers_id]
     fk [vehicle_id - > vehicle.unique_id
          parts_id - > parts.unique_part_number
               suppliers_id — > suppliers.unique_name]

Manager (military_rank, personal_id):
     pk [personal_id]
     fk [personal_id — > personal.unique_id]

HR (job_title, personal_id):
     pk [personal_id]
     fk [personal_id — > personal.unique_id]

Astronaut (no._of_missions, personal_id):
     pk [personal_id]
     fk [personal_id — > personal.unique_id]

Land (wheel_type, vehicle_id):
     pk [vehicle_id]
     fk [vehicle_id — > vehicles.unique_id]
```

```
Air (engineer_type, vehicle_id):
     pk [vehicle_id]
     fk [vehicle_id — > vehicles.unique_id]

Space (no_of_missions, unique_id, last_launch, first_launch):
     pk [vehicle_id]
     fk [vehicle_id — > vehicles.unique_id]

Pilots (flying_hours, personal_id):
     pk [personal_id]
     fk [personal_id — > personal.unique_id]

Commanders (number_of_missions_lead, personal_id):
     pk [personal_id]
     fk [personal_id —> personal.unique_id]

Engineers (speciality, personal_id):
     pk [personal_id]
     fk [personal_id — > personal.unique_id]
```

Documentation For The Physical Design Of The University Database

```
--For this part I created a table for each table in the physical
--design, Values I assigned according to the layout of values in
--the insert document, ie VarChar is for values with char and
--mixed char and ints, like course subject names, foreign keys
--represent the arrows on the physical design
```

Student		
Field	**Data Type**	**Constraints**
id	Integer	Unsigned, 0-4294967295, primary key
name	VarChar	255 characters, not null
dept_name	VarChar	100 characters, foreign key
tot_cred	SmallInt	Unsigned, 0-65535
Takes		
Field	**Data Type**	**Constraints**
id	Integer	Unsigned, 0-4294967295, primary key, foreign key
course_id	VarChar	100 characters, primary key, foreign key
sec_id	SmallInt	Unsigned, 0-65535, primary key, foreign key
semester	Char	100 characters, primary key, foreign key
year	SmallInt	Unsigned, 0-65535, not null, primary key, foreign key
grade	VarChar	15 characters, not null
Section		
Field	**Data Type**	**Constraints**
course_id	VarChar	100 characters, primary key, foreign key
sec_id	SmallInt	Unsigned, 0-65535, primary key

semester	Char	100 characters, primary key
year	SmallInt	Unsigned, 0-65535, primary key
building	Char	100 characters, foreign key
room_no	SmallInt	Unsigned, 0-65535, foreign key
time_slot_id	Char	15 characters, foreign key
Time_slot		
Field	**Data Type**	**Constraints**
time_slot_id	Char	15 characters, not null, primary key
day	Char	15 characters, not null, primary key
start_hour	SmallInt	Unsigned, 0-65535, not null, primary key
start_min	SmallInt	Unsigned, 0-65535, not null, primary key
end_hour	SmallInt	Unsigned, 0-65535, not null
end_min	SmallInt	Unsigned, 0-65535, not null
Classroom		
Field	**Data Type**	**Constraints**
building	Char	100 characters, primary key
room_no	SmallInt	Unsigned, 0-65535, primary key
capacity	SmallInt	Unsigned, 0-65535, not null
Teaches		
Field	**Data Type**	**Constraints**
id	Integer	Unsigned, 0-4294967295, primary key, foreign key
course_id	VarChar	100 characters, primary key, foreign key
sec_id	SmallInt	Unsigned, 0-65535, primary key, foreign key
semester	Char	100 characters, primary key, foreign key
year	SmallInt	Unsigned, 0-65535, primary key, foreign key
Course		
Field	**Data Type**	**Constraints**
course_id	VarChar	15 characters, primary key
title	Char	100 characters, not null
dept_name	VarChar	100 characters, foreign key
credits	SmallInt	Unsigned, 0-65535
Prereq		

Field	**Data Type**	**Constraints**
course_id	VarChar	100 characters, primary key, foreign key
prereq_id	VarChar	100 characters, primary key, foreign key
Instructor		
Field	**Data Type**	**Constraints**
id	Integer	Unsigned, 0-4294967295, primary key
name	Char	100 characters, not null
dept_name	VarChar	100 characters, foreign key
salary	Integer	Unsigned, 0-4294967295
Advisor		
Field	**Data Type**	**Constraints**
s_id	Integer	Unsigned, 0-4294967295, primary key, foreign key
i_id	Integer	Unsigned, 0-4294967295, foreign key
Department		
Field	**Data Type**	**Constraints**
dept_name	VarChar	100 characters, primary key
building	Char	100 characters, not null
budget	Integer	Unsigned, 0-65535, not null

Implement The University Database Using MySQL Statements

```
--this section written in sql, primary keys are the underlined values,
--there can be multiple, foreign keys I have split up according to if they
--point to a different table (see advisor). Not null assigned to values
--which cannot be null.
```

```
CREATE TABLE classroom (
                         building    CHAR(100),
                         room_no     SMALLINT UNSIGNED,
                         capacity    SMALLINT UNSIGNED NOT NULL,
                         PRIMARY KEY (building, room_no)
                         );

CREATE TABLE department (
                         dept_name   VARCHAR(100),
                         building    CHAR(100) NOT NULL,
                         budget            INT UNSIGNED NOT NULL,
                         PRIMARY KEY (dept_name)
                         );

CREATE TABLE instructor (
                         id          INT UNSIGNED,
                         name        CHAR(100) NOT NULL,
                         dept_name   VARCHAR(100),
                         salary            INT UNSIGNED,
                         PRIMARY KEY (id),
                         FOREIGN KEY (dept_name)
                                REFERENCES Department(dept_name)
                         );

CREATE TABLE course (
                         course_id   VARCHAR(15),
                         title       CHAR(100) NOT NULL,
                         dept_name   VARCHAR(100),
                         credits           SMALLINT UNSIGNED,
                         PRIMARY KEY (course_id),
                         FOREIGN KEY (dept_name)
                               REFERENCES Department(dept_name)
                         );

CREATE TABLE student (
                         Id          INT UNSIGNED,
                         name        VARCHAR(255) NOT NULL,
                         dept_name   VARCHAR(100),
                         tot_cred    SMALLINT UNSIGNED,
                         PRIMARY KEY (id),
                         FOREIGN KEY (dept_name)
                               REFERENCES Department(dept_name)
                         );

CREATE TABLE time_slot (
                         time_slot_id      CHAR(15) NOT NULL,
                         Day         CHAR(15) NOT NULL,
                         start_hour  SMALLINT UNSIGNED NOT NULL,
                         start_min   SMALLINT UNSIGNED NOT NULL,
                         end_hour    SMALLINT UNSIGNED NOT NULL,
                         end_min     SMALLINT UNSIGNED NOT NULL,
                         PRIMARY KEY (time_slot_id, day, start_hour,
                         start_min)
                         );
```

```
CREATE TABLE advisor (
                         s_id        INT UNSIGNED,
                         i_id        INT UNSIGNED,
                         PRIMARY KEY (s_id),
                         FOREIGN KEY (s_id)
                               REFERENCES Student(s_id),
                         FOREIGN KEY (i_id)
                               REFERENCES Instructor(i_id)
                         );

CREATE TABLE prereq (
                         course_id   VARCHAR(100),
                         prereq_id   VARCHAR(100),
                         PRIMARY KEY (course_id, prereq_id),
                         FOREIGN KEY (course_id)
                               REFERENCES Course(course_id),
                         FOREIGN KEY (prereq_id)
                               REFERENCES Course(prereq_id)
                         );

CREATE TABLE section (
                         course_id   VARCHAR(100),
                         sec_id            SMALLINT UNSIGNED,
                         semester    CHAR(100),
                         year        SMALLINT UNSIGNED,
                         building    CHAR(100),
                         room_no     SMALLINT UNSIGNED,
                         time_slot_id      CHAR(15),
                         PRIMARY KEY(course_id, sec_id, semester, year),
                         FOREIGN KEY (course_id)
                               REFERENCES Course(course_id),
                         FOREIGN KEY (building, room_no)
                               REFERENCES Classroom(building, room_no),
                         FOREIGN KEY (time_slot_id)
                               REFERENCES Time_slot(time_slot_id)
                         );

CREATE TABLE teaches (
                         id          INT UNSIGNED,
                         course_id   VARCHAR(100),
                         sec_id            SMALLINT UNSIGNED,
                         semester    CHAR(100),
                         year        SMALLINT UNSIGNED,
                         PRIMARY KEY(id, course_id, sec_id, semester, year),
                         FOREIGN KEY (id)
                               REFERENCES Instructor(id),
                         FOREIGN KEY (course_id, sec_id, semester, year)
                               REFERENCES Section(course_id, sec_id,
                         semester, year)
                         );
```

```
CREATE TABLE takes (
                         id          INT UNSIGNED,
                         course_id   VARCHAR(100),
                         sec_id            SMALLINT UNSIGNED,
                         semester    CHAR(100),
                         year        SMALLINT UNSIGNED NOT NULL,
                         grade       VARCHAR(15),
                         PRIMARY KEY(id, course_id, sec_id, semester, year),
                         FOREIGN KEY (course_id, sec_id, semester, year)
                               REFERENCES Section(course_id, sec_id,
                               semester, year),
                         FOREIGN KEY (id)
                               REFERENCES Student(id)
                         );
```

Add Test Records For Each Of The Tables

```
insert into classroom values ('Packard', '101', '500');
insert into classroom values ('Painter', '514', '10');
insert into classroom values ('Taylor', '3128', '70');
insert into classroom values ('Watson', '100', '30');
insert into classroom values ('Watson', '120', '50');
insert into department values ('Biology', 'Watson', '90000');
insert into department values ('Comp. Sci.', 'Taylor', '100000');
insert into department values ('Elec. Eng.', 'Taylor', '85000');
insert into department values ('Finance', 'Painter', '120000');
insert into department values ('History', 'Painter', '50000');
insert into department values ('Music', 'Packard', '80000');
insert into department values ('Physics', 'Watson', '70000');
insert into course values ('BIO-101', 'Intro. to Biology',
'Biology', '4');
insert into course values ('BIO-301', 'Genetics', 'Biology', '4');
insert into course values ('BIO-399', 'Computational Biology',
'Biology', '3');
insert into course values ('CS-101', 'Intro. to Computer Science',
'Comp. Sci.', '4');
insert into course values ('CS-190', 'Game Design', 'Comp. Sci.',
'4');
insert into course values ('CS-315', 'Robotics', 'Comp. Sci.',
'3');
```

```
insert into course values ('CS-319', 'Image Processing', 'Comp.
Sci.', '3');
insert into course values ('CS-347', 'Database System Concepts',
'Comp. Sci.', '3');
insert into course values ('EE-181', 'Intro. to Digital Systems',
'Elec. Eng.', '3');
insert into course values ('FIN-201', 'Investment Banking',
'Finance', '3');
insert into course values ('HIS-351', 'World History', 'History',
'3');
insert into course values ('MU-199', 'Music Video Production',
'Music', '3');
insert into course values ('PHY-101', 'Physical Principles',
'Physics', '4');
insert into instructor values ('10101', 'Srinivasan', 'Comp.
Sci.', '65000');
insert into instructor values ('12121', 'Wu', 'Finance', '90000');
insert into instructor values ('15151', 'Mozart', 'Music',
'40000');
insert into instructor values ('22222', 'Einstein', 'Physics',
'95000');
insert into instructor values ('32343', 'El Said', 'History',
'60000');
insert into instructor values ('33456', 'Gold', 'Physics',
'87000');
insert into instructor values ('45565', 'Katz', 'Comp. Sci.',
'75000');
insert into instructor values ('58583', 'Califieri', 'History',
'62000');
insert into instructor values ('76543', 'Singh', 'Finance',
'80000');
insert into instructor values ('76766', 'Crick', 'Biology',
'72000');
insert into instructor values ('83821', 'Brandt', 'Comp. Sci.',
'92000');
insert into instructor values ('98345', 'Kim', 'Elec. Eng.',
'80000');
insert into section values ('BIO-101', '1', 'Summer', '2009',
'Painter', '514', 'B');
insert into section values ('BIO-301', '1', 'Summer', '2010',
'Painter', '514', 'A');
insert into section values ('CS-101', '1', 'Fall', '2009',
'Packard', '101', 'H');
insert into section values ('CS-101', '1', 'Spring', '2010',
'Packard', '101', 'F');
```

```
insert into section values ('CS-190', '1', 'Spring', '2009',
'Taylor', '3128', 'E');
insert into section values ('CS-190', '2', 'Spring', '2009',
'Taylor', '3128', 'A');
insert into section values ('CS-315', '1', 'Spring', '2010',
'Watson', '120', 'D');
insert into section values ('CS-319', '1', 'Spring', '2010',
'Watson', '100', 'B');
insert into section values ('CS-319', '2', 'Spring', '2010',
'Taylor', '3128', 'C');
insert into section values ('CS-347', '1', 'Fall', '2009',
'Taylor', '3128', 'A');
insert into section values ('EE-181', '1', 'Spring', '2009',
'Taylor', '3128', 'C');
insert into section values ('FIN-201', '1', 'Spring', '2010',
'Packard', '101', 'B');
insert into section values ('HIS-351', '1', 'Spring', '2010',
'Painter', '514', 'C');
insert into section values ('MU-199', '1', 'Spring', '2010',
'Packard', '101', 'D');
insert into section values ('PHY-101', '1', 'Fall', '2009',
'Watson', '100', 'A');
insert into teaches values ('10101', 'CS-101', '1', 'Fall',
'2009');
insert into teaches values ('10101', 'CS-315', '1', 'Spring',
'2010');
insert into teaches values ('10101', 'CS-347', '1', 'Fall',
'2009');
insert into teaches values ('12121', 'FIN-201', '1', 'Spring',
'2010');
insert into teaches values ('15151', 'MU-199', '1', 'Spring',
'2010');
insert into teaches values ('22222', 'PHY-101', '1', 'Fall',
'2009');
insert into teaches values ('32343', 'HIS-351', '1', 'Spring',
'2010');
insert into teaches values ('45565', 'CS-101', '1', 'Spring',
'2010');
insert into teaches values ('45565', 'CS-319', '1', 'Spring',
'2010');
insert into teaches values ('76766', 'BIO-101', '1', 'Summer',
'2009');
insert into teaches values ('76766', 'BIO-301', '1', 'Summer',
'2010');
insert into teaches values ('83821', 'CS-190', '1', 'Spring',
'2009');
```

```
insert into teaches values ('83821', 'CS-190', '2', 'Spring',
'2009');
insert into teaches values ('83821', 'CS-319', '2', 'Spring',
'2010');
insert into teaches values ('98345', 'EE-181', '1', 'Spring',
'2009');
insert into student values ('00128', 'Zhang', 'Comp. Sci.',
'102');
insert into student values ('12345', 'Shankar', 'Comp. Sci.',
'32');
insert into student values ('19991', 'Brandt', 'History', '80');
insert into student values ('23121', 'Chavez', 'Finance', '110');
insert into student values ('44553', 'Peltier', 'Physics', '56');
insert into student values ('45678', 'Levy', 'Physics', '46');
insert into student values ('54321', 'Williams', 'Comp. Sci.',
'54');
insert into student values ('55739', 'Sanchez', 'Music', '38');
insert into student values ('70557', 'Snow', 'Physics', '0');
insert into student values ('76543', 'Brown', 'Comp. Sci.', '58');
insert into student values ('76653', 'Aoi', 'Elec. Eng.', '60');
insert into student values ('98765', 'Bourikas', 'Elec. Eng.',
'98');
insert into student values ('98988', 'Tanaka', 'Biology', '120');
insert into takes values ('00128', 'CS-101', '1', 'Fall', '2009',
'A');
insert into takes values ('00128', 'CS-347', '1', 'Fall', '2009',
'A-');
insert into takes values ('12345', 'CS-101', '1', 'Fall', '2009',
'C');
insert into takes values ('12345', 'CS-190', '2', 'Spring',
'2009', 'A');
insert into takes values ('12345', 'CS-315', '1', 'Spring',
'2010', 'A');
insert into takes values ('12345', 'CS-347', '1', 'Fall', '2009',
'A');
insert into takes values ('19991', 'HIS-351', '1', 'Spring',
'2010', 'B');
insert into takes values ('23121', 'FIN-201', '1', 'Spring',
'2010', 'C+');
insert into takes values ('44553', 'PHY-101', '1', 'Fall', '2009',
'B-');
insert into takes values ('45678', 'CS-101', '1', 'Fall', '2009',
'F');
insert into takes values ('45678', 'CS-101', '1', 'Spring',
'2010', 'B+');
```

```
insert into takes values ('45678', 'CS-319', '1', 'Spring',
'2010', 'B');
insert into takes values ('54321', 'CS-101', '1', 'Fall', '2009',
'A-');
insert into takes values ('54321', 'CS-190', '2', 'Spring',
'2009', 'B+');
insert into takes values ('55739', 'MU-199', '1', 'Spring',
'2010', 'A-');
insert into takes values ('76543', 'CS-101', '1', 'Fall', '2009',
'A');
insert into takes values ('76543', 'CS-319', '2', 'Spring',
'2010', 'A');
insert into takes values ('76653', 'EE-181', '1', 'Spring',
'2009', 'C');
insert into takes values ('98765', 'CS-101', '1', 'Fall', '2009',
'C-');
insert into takes values ('98765', 'CS-315', '1', 'Spring',
'2010', 'B');
insert into takes values ('98988', 'BIO-101', '1', 'Summer',
'2009', 'A');
insert into takes values ('98988', 'BIO-301', '1', 'Summer',
'2010', null);
insert into advisor values ('00128', '45565');
insert into advisor values ('12345', '10101');
insert into advisor values ('23121', '76543');
insert into advisor values ('44553', '22222');
insert into advisor values ('45678', '22222');
insert into advisor values ('76543', '45565');
insert into advisor values ('76653', '98345');
insert into advisor values ('98765', '98345');
insert into advisor values ('98988', '76766');
insert into time_slot values ('A', 'M', '8', '0', '8', '50');
insert into time_slot values ('A', 'W', '8', '0', '8', '50');
insert into time_slot values ('A', 'F', '8', '0', '8', '50');
insert into time_slot values ('B', 'M', '9', '0', '9', '50');
insert into time_slot values ('B', 'W', '9', '0', '9', '50');
insert into time_slot values ('B', 'F', '9', '0', '9', '50');
insert into time_slot values ('C', 'M', '11', '0', '11', '50');
insert into time_slot values ('C', 'W', '11', '0', '11', '50');
insert into time_slot values ('C', 'F', '11', '0', '11', '50');
insert into time_slot values ('D', 'M', '13', '0', '13', '50');
insert into time_slot values ('D', 'W', '13', '0', '13', '50');
insert into time_slot values ('D', 'F', '13', '0', '13', '50');
insert into time_slot values ('E', 'T', '10', '30', '11', '45 ');
insert into time_slot values ('E', 'R', '10', '30', '11', '45 ');
insert into time_slot values ('F', 'T', '14', '30', '15', '45 ');
insert into time_slot values ('F', 'R', '14', '30', '15', '45 ');
insert into time_slot values ('G', 'M', '16', '0', '16', '50');
insert into time_slot values ('G', 'W', '16', '0', '16', '50');
insert into time_slot values ('G', 'F', '16', '0', '16', '50');
insert into time_slot values ('H', 'W', '10', '0', '12', '30');
insert into prereq values ('BIO-301', 'BIO-101');
insert into prereq values ('BIO-399', 'BIO-101');
insert into prereq values ('CS-190', 'CS-101');
insert into prereq values ('CS-315', 'CS-101');
insert into prereq values ('CS-319', 'CS-101');
insert into prereq values ('CS-347', 'CS-101');
insert into prereq values ('EE-181', 'PHY-101');
```

TASK 5

```
--Find the names of all students who have taken at least one
--computer science course, making sure there are no duplicate
--names in the result.

SELECT DISTINCT student.name FROM student, takes
     WHERE student.ID = takes.ID
     AND takes.course_id LIKE '%CS%';
```

TASK 6

```
--Find the IDs and names of all students with a fail grade.

SELECT student.id, student.name FROM student, takes
     WHERE student.ID = takes.ID
     AND   takes.grade = 'F';
```

TASK 7

```
--For each department, find the maximum salary of instructors in
--that department. Every department should have at least one
--instructor.

SELECT department.dept_name, instructor.salary
     FROM instructor, department
     WHERE (department.dept_name, instructor.salary) IN
```

```
        (SELECT department.dept_name, MAX(instructor.salary)
        FROM instructor, department GROUP BY department.dept_name)


--As an extra note I wanted to add that due to me interrupting my
--degree last year, I have reused some of my coursework, hence any
--academic malpractice that flags is simply a copy of my own work.
```