CS 313: Databases and Information Systems Laboratory Assignment - 1

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1. The integrity constraints are as follows,

Table	Primary Key	Domain of PK	Foreign Key (Referencing Table)	Not Null
classroom	(building, room number)	Character		
department	(dept_name)	Character		
course	(course_id)	Character	(dept_name) references department	
instructor	(ID)	Character	(dept_name) references department	name
section	(course_id, sec_id, semester, year)	Character, Numeric	(course_id) references course (building, room_number) references classroom	
teaches	(ID, course_id, sec_id, semester, year)	Character, Numeric	(course_id,sec_id, semester, year) references section	
student	(ID)	Character	(dept_name) references department	name
takes	(ID, course_id, sec_id, semester, year)	Character, Numeric	(course_id,sec_id, semester, year) references section (ID) references student	
advisor	(s_ID)	Character	(i_ID) references instructor (ID) (s_ID) references student (ID)	
time_slot	(time_slot_id, day, start_hr, start_min)	Character, Numeric		
prereq	(course_id, prereq_id)	Character	(course_id) references course (prereq_id) references course	

2.

Query:

```sql
-- Find all the details of a student
SELECT *
FROM student, department, takes, advisor, instructor
WHERE student.dept_name = department.dept_name AND student.ID = takes.ID AND
student.ID = advisor.s_ID AND advisor.i_ID = instructor.ID AND student.ID =
45678;
```

Result:

ID	name	dept_name	tot_cred	dept_name	building	budget	ID	course_id	sec_id	semester	year	grade	s_ID	i_ID	ID	name	dept_name	salary
45678	Levy	Physics	46	Physics	Watson	70000	45678	CS-101	1	Fall	2017	F	45678	22222	22222	Einstein	Physics	95000
45678	Levy	Physics	46	Physics	Watson	70000	45678	CS-101	1	Spring	2018	B+	45678	22222	22222	Einstein	Physics	95000
45678	Levy	Physics	46	Physics	Watson	70000	45678	CS-319	1	Spring	2018	B	45678	22222	22222	Einstein	Physics	95000

3.

Query:

```sql
-- Einstein wants to find which rooms are available in his department and
their capacities
SELECT building, room_number, capacity
FROM instructor
NATURAL JOIN classroom
NATURAL JOIN department
WHERE ID = '22222';
```

Result:

building	room_number	capacity
Watson	100	30
Watson	120	50

Query:

```sql
-- Find details of the prerequisite courses for a BIO-339 ie. Computational
Biology
SELECT *
FROM course
WHERE course_id = (
  SELECT prereq_id
  FROM course
  NATURAL JOIN prereq
  WHERE course_id = 'BIO-399'
);
```

Result:

course_id	title	dept_name	credits
BIO-101	Intro. to Biology	Biology	4

Query:

```sql
-- Find the distibution of grades for the students of each advisor
SELECT name, grade, COUNT(grade)
FROM instructor, advisor,    takes
WHERE instructor.ID = advisor.i_ID AND advisor.s_ID = takes.ID
GROUP BY grade, name
ORDER BY name, grade;
```

Result:

name	grade	COUNT(grade)
Crick		0
Crick	A	1
Einstein	B	1
Einstein	B+	1
Einstein	B-	1
Einstein	F	1
Katz	A	3
Katz	A-	1
Kim	B	1
Kim	C	1
Kim	C-	1
Singh	C+	1
Srinivasan	A	3
Srinivasan	C	1

Query:

```sql
-- Find the name and department of instructors who had a class on Monday in 2018
SELECT name, dept_name
FROM instructor
NATURAL JOIN teaches
NATURAL JOIN section
NATURAL JOIN time_slot
WHERE day = 'M' AND year = 2018;
```

Result:

name	dept_name
Srinivasan	Comp. Sci.
Wu	Finance
Mozart	Music
El Said	History
Katz	Comp. Sci.
Crick	Biology
Brandt	Comp. Sci.

Query:

```sql
-- Remove BIO-101 from the prequisite of BIO-399 and see the table before
and after
SELECT * FROM prereq;
DELETE FROM prereq
WHERE course_id = 'BIO-399' AND prereq_id = 'BIO-101';
SELECT * FROM prereq;
```

Result:

course_id	prereq_id
BIO-301	BIO-101
BIO-399	BIO-101
CS-190	CS-101
CS-315	CS-101
CS-319	CS-101
CS-347	CS-101
EE-181	PHY-101

course_id	prereq_id
BIO-301	BIO-101
CS-190	CS-101
CS-315	CS-101
CS-319	CS-101
CS-347	CS-101
EE-181	PHY-101

Query:

```sql
-- Add new classroom and see the table before and after
SELECT * FROM classroom;
INSERT INTO classroom VALUES ('Seshu', 315, 150);
SELECT * FROM classroom;
```

Result:

building	room_number	capacity
Packard	101	500
Painter	514	10
Taylor	3128	70
Watson	100	30
Watson	120	50

building	room_number	capacity
Packard	101	500
Painter	514	10
Taylor	3128	70
Watson	100	30
Watson	120	50
Seshu	315	150

Query:

```sql
-- Add new department and see the table before and after
SELECT * FROM department;
INSERT INTO department VALUES ('MMAE', 'Seshu', 75000);
SELECT * FROM department;
```

Result:

dept_name	building	budget
Biology	Watson	90000
Comp. Sci.	Taylor	100000
Elec. Eng.	Taylor	85000
Finance	Painter	120000
History	Painter	50000
Music	Packard	80000
Physics	Watson	70000

dept_name	building	budget
Biology	Watson	90000
Comp. Sci.	Taylor	100000
Elec. Eng.	Taylor	85000
Finance	Painter	120000
History	Painter	50000
Music	Packard	80000
Physics	Watson	70000
MMAE	Seshu	75000

Query:

```sql
-- Add new course and see the table before and after
SELECT * FROM course;
INSERT INTO course VALUES ('ME-101', 'Engineering Drawing', 'MMAE', 3);
SELECT * FROM course;
```

Result:

course_id	title	dept_name	credits
BIO-101	Intro. to Biology	Biology	4
BIO-301	Genetics	Biology	4
BIO-399	Computational Biology	Biology	3
CS-101	Intro. to Computer Science	Comp. Sci.	4
CS-190	Game Design	Comp. Sci.	4
CS-315	Robotics	Comp. Sci.	3
CS-319	Image Processing	Comp. Sci.	3
CS-347	Database System Concepts	Comp. Sci.	3
EE-181	Intro. to Digital Systems	Elec. Eng.	3
FIN-201	Investment Banking	Finance	3
HIS-351	World History	History	3
MU-199	Music Video Production	Music	3
PHY-101	Physical Principles	Physics	4

course_id	title	dept_name	credits
BIO-101	Intro. to Biology	Biology	4
BIO-301	Genetics	Biology	4
BIO-399	Computational Biology	Biology	3
CS-101	Intro. to Computer Science	Comp. Sci.	4
CS-190	Game Design	Comp. Sci.	4
CS-315	Robotics	Comp. Sci.	3
CS-319	Image Processing	Comp. Sci.	3
CS-347	Database System Concepts	Comp. Sci.	3
EE-181	Intro. to Digital Systems	Elec. Eng.	3
FIN-201	Investment Banking	Finance	3
HIS-351	World History	History	3
MU-199	Music Video Production	Music	3
PHY-101	Physical Principles	Physics	4
ME-101	Engineering Drawing	MMAE	3

Query:

```
-- Add new instructor and see the table before and after
SELECT * FROM instructor;
INSERT INTO instructor VALUES ('36781', 'P Seshu', 'MMAE', 95000);
SELECT * FROM instructor;
```

Result:

ID	name	dept_name	salary
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000
33456	Gold	Physics	87000
45565	Katz	Comp. Sci.	75000
58583	Califieri	History	62000
76543	Singh	Finance	80000
76766	Crick	Biology	72000
83821	Brandt	Comp. Sci.	92000
98345	Kim	Elec. Eng.	80000

ID	name	dept_name	salary
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000
33456	Gold	Physics	87000
45565	Katz	Comp. Sci.	75000
58583	Califieri	History	62000
76543	Singh	Finance	80000
76766	Crick	Biology	72000
83821	Brandt	Comp. Sci.	92000
98345	Kim	Elec. Eng.	80000
36781	P Seshu	MMAE	95000

Query:

```sql
-- Add new section and see the table before and after
SELECT * FROM section;
INSERT INTO section VALUES ('ME-101', '1', 'Fall', 2020, 'Seshu', 315, 'A');
SELECT * FROM section;
```

Result:

course_id	sec_id	semester	year	building	room_number	time_slot_id
BIO-101	1	Summer	2017	Painter	514	B
BIO-301	1	Summer	2018	Painter	514	A
CS-101	1	Fall	2017	Packard	101	H
CS-101	1	Spring	2018	Packard	101	F
CS-190	1	Spring	2017	Taylor	3128	E
CS-190	2	Spring	2017	Taylor	3128	A
CS-315	1	Spring	2018	Watson	120	D
CS-319	1	Spring	2018	Watson	100	B
CS-319	2	Spring	2018	Taylor	3128	C
CS-347	1	Fall	2017	Taylor	3128	A
EE-181	1	Spring	2017	Taylor	3128	C
FIN-201	1	Spring	2018	Packard	101	B
HIS-351	1	Spring	2018	Painter	514	C
MU-199	1	Spring	2018	Packard	101	D
PHY-101	1	Fall	2017	Watson	100	A

course_id	sec_id	semester	year	building	room_number	time_slot_id
BIO-101	1	Summer	2017	Painter	514	B
BIO-301	1	Summer	2018	Painter	514	A
CS-101	1	Fall	2017	Packard	101	H
CS-101	1	Spring	2018	Packard	101	F
CS-190	1	Spring	2017	Taylor	3128	E
CS-190	2	Spring	2017	Taylor	3128	A
CS-315	1	Spring	2018	Watson	120	D
CS-319	1	Spring	2018	Watson	100	B
CS-319	2	Spring	2018	Taylor	3128	C
CS-347	1	Fall	2017	Taylor	3128	A
EE-181	1	Spring	2017	Taylor	3128	C
FIN-201	1	Spring	2018	Packard	101	B
HIS-351	1	Spring	2018	Painter	514	C
MU-199	1	Spring	2018	Packard	101	D
PHY-101	1	Fall	2017	Watson	100	A
ME-101	1	Fall	2020	Seshu	315	A

Query:

```sql
-- Add new teaches and see the table before and after
SELECT * FROM teaches;
INSERT INTO teaches VALUES ('36781', 'ME-101', 1, 'Fall', 2020);
SELECT * FROM teaches;
```

Result:

ID	course_id	sec_id	semester	year
10101	CS-101	1	Fall	2017
10101	CS-315	1	Spring	2018
10101	CS-347	1	Fall	2017
12121	FIN-201	1	Spring	2018
15151	MU-199	1	Spring	2018
22222	PHY-101	1	Fall	2017
32343	HIS-351	1	Spring	2018
45565	CS-101	1	Spring	2018
45565	CS-319	1	Spring	2018
76766	BIO-101	1	Summer	2017
76766	BIO-301	1	Summer	2018
83821	CS-190	1	Spring	2017
83821	CS-190	2	Spring	2017
83821	CS-319	2	Spring	2018
98345	EE-181	1	Spring	2017

ID	course_id	sec_id	semester	year
10101	CS-101	1	Fall	2017
10101	CS-315	1	Spring	2018
10101	CS-347	1	Fall	2017
12121	FIN-201	1	Spring	2018
15151	MU-199	1	Spring	2018
22222	PHY-101	1	Fall	2017
32343	HIS-351	1	Spring	2018
45565	CS-101	1	Spring	2018
45565	CS-319	1	Spring	2018
76766	BIO-101	1	Summer	2017
76766	BIO-301	1	Summer	2018
83821	CS-190	1	Spring	2017
83821	CS-190	2	Spring	2017
83821	CS-319	2	Spring	2018
98345	EE-181	1	Spring	2017
36781	ME-101	1	Fall	2020

Query:

```sql
-- Add new student and see the table before and after
SELECT * FROM student;
INSERT INTO student VALUES ('12121', 'Aditya', 'MMAE', 3);
SELECT * FROM student;
```

Result:

ID	name	dept_name	tot_cred
00128	Zhang	Comp. Sci.	102
12345	Shankar	Comp. Sci.	32
19991	Brandt	History	80
23121	Chavez	Finance	110
44553	Peltier	Physics	56
45678	Levy	Physics	46
54321	Williams	Comp. Sci.	54
55739	Sanchez	Music	38
70557	Snow	Physics	0
76543	Brown	Comp. Sci.	58
76653	Aoi	Elec. Eng.	60
98765	Bourikas	Elec. Eng.	98
98988	Tanaka	Biology	120

ID	name	dept_name	tot_cred
00128	Zhang	Comp. Sci.	102
12345	Shankar	Comp. Sci.	32
19991	Brandt	History	80
23121	Chavez	Finance	110
44553	Peltier	Physics	56
45678	Levy	Physics	46
54321	Williams	Comp. Sci.	54
55739	Sanchez	Music	38
70557	Snow	Physics	0
76543	Brown	Comp. Sci.	58
76653	Aoi	Elec. Eng.	60
98765	Bourikas	Elec. Eng.	98
98988	Tanaka	Biology	120
12121	Aditya	MMAE	3

Query:

```sql
-- Add new takes and see the table before and after
SELECT * FROM takes;
INSERT INTO takes VALUES ('12121', 'ME-101', 1, 'Fall', 2020, 'B+');
SELECT * FROM takes;
```

Result:

ID	course_id	sec_id	semester	year	grade
00128	CS-101	1	Fall	2017	A
00128	CS-347	1	Fall	2017	A-
12345	CS-101	1	Fall	2017	C
12345	CS-190	2	Spring	2017	A
12345	CS-315	1	Spring	2018	A
12345	CS-347	1	Fall	2017	A
19991	HIS-351	1	Spring	2018	B
23121	FIN-201	1	Spring	2018	C+
44553	PHY-101	1	Fall	2017	B-
45678	CS-101	1	Fall	2017	F
45678	CS-101	1	Spring	2018	B+
45678	CS-319	1	Spring	2018	B
54321	CS-101	1	Fall	2017	A-
54321	CS-190	2	Spring	2017	B+
55739	MU-199	1	Spring	2018	A-
76543	CS-101	1	Fall	2017	A
76543	CS-319	2	Spring	2018	A
76653	EE-181	1	Spring	2017	C
98765	CS-101	1	Fall	2017	C-
98765	CS-315	1	Spring	2018	B
98988	BIO-101	1	Summer	2017	A
98988	BIO-301	1	Summer	2018	

ID	course_id	sec_id	semester	year	grade
00128	CS-101	1	Fall	2017	A
00128	CS-347	1	Fall	2017	A-
12345	CS-101	1	Fall	2017	C
12345	CS-190	2	Spring	2017	A
12345	CS-315	1	Spring	2018	A
12345	CS-347	1	Fall	2017	A
19991	HIS-351	1	Spring	2018	B
23121	FIN-201	1	Spring	2018	C+
44553	PHY-101	1	Fall	2017	B-
45678	CS-101	1	Fall	2017	F
45678	CS-101	1	Spring	2018	B+
45678	CS-319	1	Spring	2018	B
54321	CS-101	1	Fall	2017	A-
54321	CS-190	2	Spring	2017	B+
55739	MU-199	1	Spring	2018	A-
76543	CS-101	1	Fall	2017	A
76543	CS-319	2	Spring	2018	A
76653	EE-181	1	Spring	2017	C
98765	CS-101	1	Fall	2017	C-
98765	CS-315	1	Spring	2018	B
98988	BIO-101	1	Summer	2017	A
98988	BIO-301	1	Summer	2018	
12121	ME-101	1	Fall	2020	B+

Query:

```sql
-- Add new advisor and see the table before and after
SELECT * FROM advisor;
INSERT INTO advisor VALUES ('12121', '36781');
SELECT * FROM advisor;
```

Result:

s_ID	i_ID
00128	45565
12345	10101
23121	76543
44553	22222
45678	22222
76543	45565
76653	98345
98765	98345
98988	76766

s_ID	i_ID
00128	45565
12345	10101
23121	76543
44553	22222
45678	22222
76543	45565
76653	98345
98765	98345
98988	76766
12121	36781

Query:

```sql
-- Add new time_slot and see the table before and after
SELECT * FROM time_slot;
INSERT INTO time_slot VALUES ('H', 'M', '9', '0', '10', '0');
SELECT * FROM time_slot;
```

Result:

time_slot_id	day	start_hr	start_min	end_hr	end_min
A	M	8	0	8	50
A	W	8	0	8	50
A	F	8	0	8	50
B	M	9	0	9	50
B	W	9	0	9	50
B	F	9	0	9	50
C	M	11	0	11	50
C	W	11	0	11	50
C	F	11	0	11	50
D	M	13	0	13	50
D	W	13	0	13	50
D	F	13	0	13	50
E	T	10	30	11	45
E	R	10	30	11	45
F	T	14	30	15	45
F	R	14	30	15	45
G	M	16	0	16	50
G	W	16	0	16	50
G	F	16	0	16	50
H	W	10	0	12	30

time_slot_id	day	start_hr	start_min	end_hr	end_min
A	M	8	0	8	50
A	W	8	0	8	50
A	F	8	0	8	50
B	M	9	0	9	50
B	W	9	0	9	50
B	F	9	0	9	50
C	M	11	0	11	50
C	W	11	0	11	50
C	F	11	0	11	50
D	M	13	0	13	50
D	W	13	0	13	50
D	F	13	0	13	50
E	T	10	30	11	45
E	R	10	30	11	45
F	T	14	30	15	45
F	R	14	30	15	45
G	M	16	0	16	50
G	W	16	0	16	50
G	F	16	0	16	50
H	W	10	0	12	30
H	M	9	0	10	0

Query:

```sql
-- Add new prereq and see the table before and after
SELECT * FROM prereq;
INSERT INTO prereq VALUES ('EE-181', 'ME-101');
SELECT * FROM prereq;
```

Result:

course_id	prereq_id
BIO-301	BIO-101
CS-190	CS-101
CS-315	CS-101
CS-319	CS-101
CS-347	CS-101
EE-181	PHY-101

course_id	prereq_id
BIO-301	BIO-101
CS-190	CS-101
CS-315	CS-101
CS-319	CS-101
CS-347	CS-101
EE-181	PHY-101
EE-181	ME-101

4.

a.

Query:

```
SELECT DISTINCT ID, name
FROM student
NATURAL JOIN takes
NATURAL JOIN section
WHERE dept_name = 'Comp. Sci.' AND building = 'Taylor';
```

Result:

ID	name
00128	Zhang
12345	Shankar
54321	Williams
76543	Brown

b.

Query:

```
SELECT ID, name
FROM student
NATURAL JOIN takes
WHERE grade = 'A'
INTERSECT
SELECT ID, name
FROM student
NATURAL JOIN takes
WHERE grade = 'C';
```

Result:

ID	name
12345	Shankar

c.
Query:

```sql
SELECT DISTINCT building, room_number
FROM section
NATURAL JOIN time_slot
WHERE day = 'W';
```

Result:

building	room_number
Painter	514
Packard	101
Taylor	3128
Watson	120
Watson	100
Seshu	315