UNIVERSITY

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Description:

i) Introduction and database description.

The university database stores details about university students, courses, the semester a student took a particular course (and his mark and grade if he completed it), and what degree program each student is enrolled in.

ii) What functions should the system perform?

filtering out unnecessary data;

Users get access to the data they need;

keep data safe;

permitting users to only have access to the records that they need;

billing;

registration of courses;

checking grade;

take attendance;

get schedule of students;

get entry records;

iii) Who are the end users?

Student

iv) Where did we get the idea for this project?

We conducted an analysis and took the idea on the SDU portal

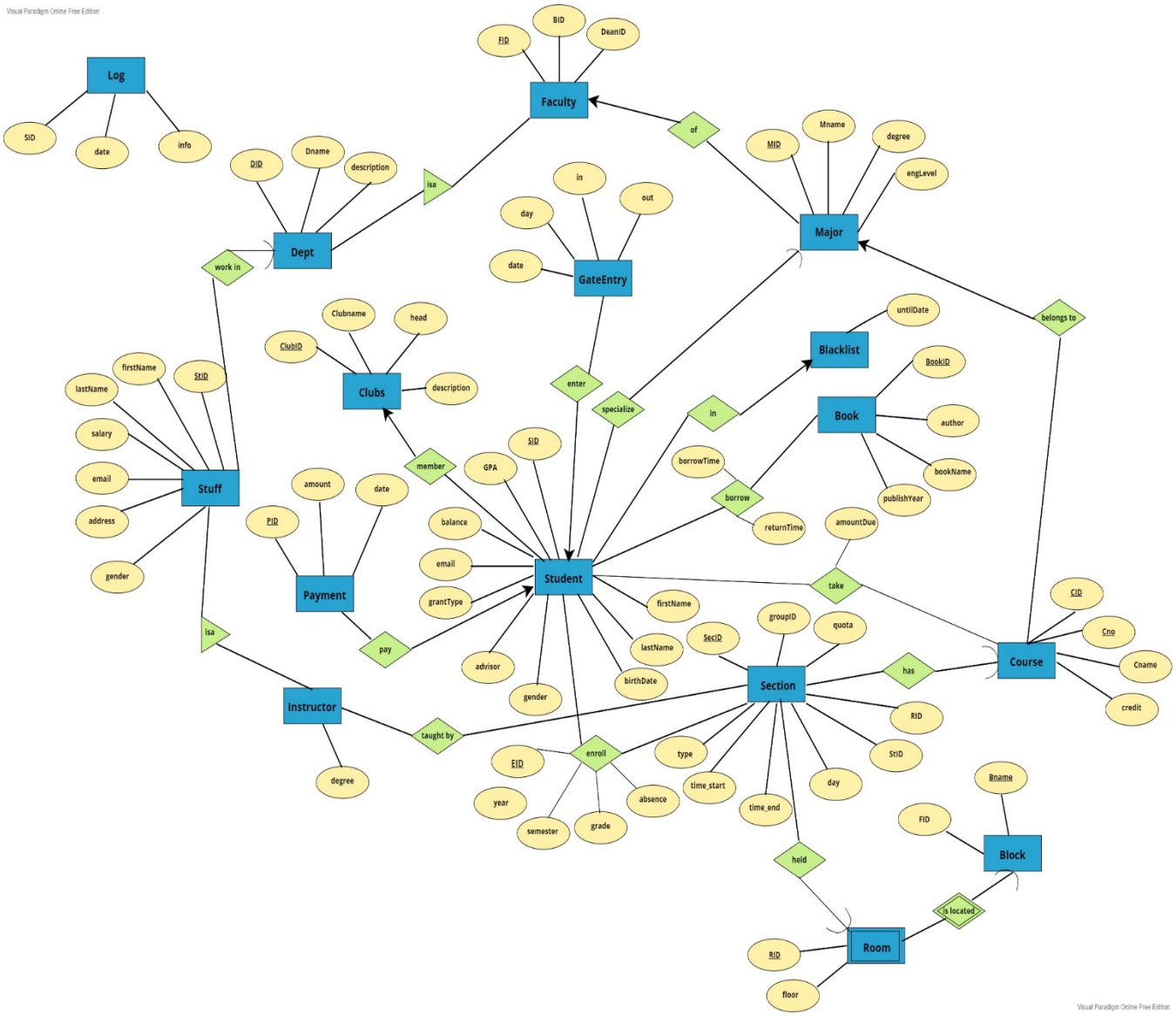
v) How will data obsolescence be handled?

By way of a function. Student data is erased three years after graduation

Entity Relationship Design:

ERD:

https://online.visual-paradigm.com/share.jsp?id=323331353736382d31



Relational Schema

- Student (SID, MID, firstName, lastName, birthDate, gender, advisor, grantType, email, balance, GPA);
- Dept (DID, Dname, description);
- Faculty (DID, FID, DeanID, BID)
- Major (FID, MID, Mname, degree, engLevel);

- Course (MID, CID, Cno, Cname, credit);
- Section (CID, SecID, groupID, quota, RID, StID, day, time_start, time_end, type);
- Block (BID, FID);
- Room (BID, RID, Rno, floor);
- Book (BookID, author, bookname, publishYear);
- borrow (borrowID, SID, BookID, returnTime, borrowTime);
- Blacklist (SID, untilDate);
- enroll (EID, SID, SecID, year, semester, absence, grade);
- taken_course (SID, CID, amountDue);
- Clubs (ClubID, Clubname, head, description);
- member (ClubID, SID);
- GateEntry (SID, date, day, gate_in, gate_out);
- Payment (PID, SID, amount, date);
- Staff (StID, DID, firstName, lastName, salary, email, address, gender)
- Instructor (StID, degree);
- Log (logID, date, info);

Normalization:

i)

- SID → MID, firstName, lastName, birthDate, gender, advisor, grantType, email, balance, GPA;
- SID, MID → firstName, lastName, birthDate, gender, advisor, grantType, email, balance, GPA;
- DID → Dname, description;

  DID, Dname → description;
- DID, FID → DeanID, BID;
- FID, MID → Mname, degree, engLevel;

  FID, MID, Mname → degree, engLevel;
- MID, CID → Cname, credit;
- MID, CID, Cname → credit;
- CID, SecID → groupID, quota, RID, StID, day, time_start, time_end, type;

  CID, SecID, groupID → quota, RID, StID, day, time_start, time_end, type;
- BID → FID;
- BID, RID → floor;
- BID, RID → Rno, floor;

- BID, RID, Rno → floor;
- BookID → author, bookname, publishYear;
- BookID, bookname → author, publishYear;
- borrowID, SID, BookID → returnTime, borrowTime;
- SID → untilDate;
- EID, SID, SecID → year, semester, absence, grade;
- SID, CID → amountDue;
- ClubID → Clubname, head, description;
- ClubID, Clubname → Clubname, head, description;
- SID, gate_in → date, day, out;

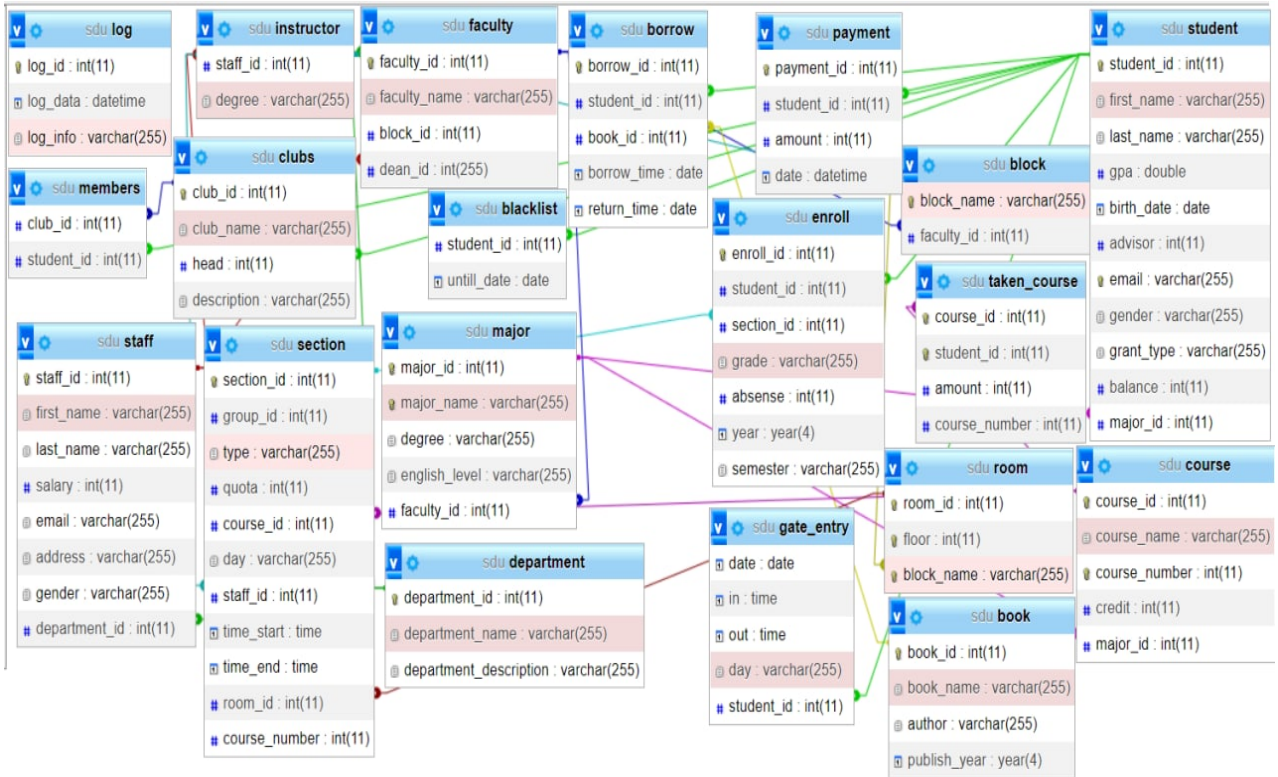
  SID, date, gate_in → day, out;
- PID → SID, amount, date;
- StID, DID → firstName, lastName, salary, email, address, gender

  StID, DID, email → firstName, lastName, salary, address, gender
- StID → degree;
- logID → date, info;

Keys and superkeys:

key of “Student” – SID;
superkey of “Student” – SID, MID;
key of “Dept” – DID;
superkey of “Dept” – DID, Dname;
key of “Faculty” – DID, FID;
key of “Major” – FID, MID;
superkey of “Major” – FID, MID, Mname;
key of “Major” – FID, MID;
superkey of “Major” – FID, MID, Mname;
key of “Course” – MID, CID;
superkey of “Course” – MID, CID, Cname;
key of “Section” – CID, SecID;
superkey of “Section” – CID, SecID, groupID;
key of “Block” – BID;
key of “Room” – BID, RID;
key of “Room” – BID, RID, Rno;

key of “Book” – BookID;
superkey of “Book” – BookID, bookname;
key of “borrow” – borrowID, SID, BookID;
key of “Blacklist” – SID;
key of “enroll” – EID, SID, SecID;
key of “taken_course” – SID, CID;
key of “Clubs” – ClubID;
superkey of “Clubs” – ClubID, Clubname;
key of “member” – ClubID, SID;
key of “GateEntry” – SID, gate_in;
superkey of “GateEntry” – SID, date, gate_in;
key of “Payment” – PID;
key of “Staff” – StID, DID;
superkey of “Staff” – StID, DID, email;
superkey of “Staff” – StID, DID, email, address;
key of “Instructor” – StID;
key of “logID” – logID;



An academic department is a division of a university dedicated to a specific academic discipline.

Faculty is a division in a university that includes one subject area or a number of related subject areas. In our case, faculties are academic departments.

A **major** is the subject that's the main focus of your degree. Most of your courses will be in your major and you'll graduate with a degree in that major.

Faculty refers to the academic staff of the institution that can be your subject teachers or other teachers of your school or college. On the other hand, staff simply means the administrative staff of the organisation like accountants, office boy, counsellor, registrar, secretary and others.

Clubs a society or an organization, operated by students at a university or a college institution, whose membership typically consists only of students and/or alumni.

GateEntry this is the place where the entry and exit times are counted.

Students may be blacklisted by the library for some reason and will be displayed untilDate with the sid in the student entity.

Student can borrow book from library.

Payment is it the tuition fee or the price of the remakes that you need to pay.

Instructor this is a subclass of staff. These are the teachers of the sections.

Sections are a group of students that have been organized for administrative purposes. When users are enrolled in a course, they are actually enrolled in one of the sections of that course. All sections of a course share the same content.

Each section has its own room, and relatively also the room is located in a certain block.

Log of each transaction is maintained in some stable storage so that if any failure occurs, then it can be recovered from there. If any operation is performed on the database, then it will be recorded in the log.

Club

club_id	student_id
10	843
10	888
10	1092
5	884
15	778
9	881
7	1028
12	967
10	787
3	1044
7	1002
12	842
2	784
14	1074
14	947
3	1012
4	1094
15	796
10	1038
6	806
6	888
10	892
10	949

Section

section_id	group_id	type	quota	course_id	day	instructor_id	time_start	time_end	room_id
6	16	P-	38	12	Thursday	11	03:53:00	10:31:00	14
7	10	L-	58	48	Friday	71	06:36:00	09:32:00	25
8	33	L-	47	8	Saturday	101	05:59:00	10:22:00	20
9	16	N-	58	21	Thursday	73	02:36:00	09:24:00	23
10	27	L-	51	57	Wednesday	40	09:18:00	11:52:00	14
11	29	N-	47	23	Friday	102	11:53:00	12:26:00	1
12	22	P-	35	43	Wednesday	72	04:55:00	01:27:00	23
13	31	L-	40	64	Saturday	83	09:21:00	05:36:00	19
14	15	L-	39	31	Tuesday	70	02:17:00	09:39:00	15
15	1	P-	53	39	Monday	95	09:44:00	09:35:00	3
16	22	N-	46	76	Friday	31	06:16:00	12:18:00	16
17	6	N-	52	44	Tuesday	53	09:38:00	12:24:00	13
18	11	L-	38	19	Saturday	82	06:41:00	03:09:00	6
19	28	N-	38	29	Monday	103	01:29:00	09:23:00	17
20	13	N-	33	49	Saturday	71	09:58:00	12:58:00	14
21	21	L-	53	49	Thursday	65	10:48:00	01:57:00	20
22	15	P-	41	59	Tuesday	31	02:53:00	03:21:00	9
23	30	L-	55	75	Monday	46	04:36:00	06:01:00	12
24	4	L-	48	92	Saturday	102	11:11:00	10:16:00	
25	14	P-	51	11	Saturday	38	06:12:00	10:26:00	6

Staff

staff_id	first_name	last_name	salary	email	address	gender	department_id
1	Aibar	Rakhimbay	500000	azamat@gmail.com	Raiymbek 7A	male	3
2	Nurbol	Erbosyn	500000	nurbol@gmail.com	Uzak 63	male	4
3	Sagi	Nurbay	600000	sagi@gmail.com	Zhamenke 45	male	5
4	Ali	Nurbay	600000	ali@gmail.com	Zhamenke 45	male	6
5	Shea	Shutt	745158	sshutt0@digg.com	23543 Waxwing Terrace	Female	6
6	Mirelle	Penny	915511	mpenny1@jimdo.com	24525 Bayside Plaza	Female	7
7	Cariotta	Rubberts	740705	crubberts2@pbs.org	16785 Bartelt Street	Female	4
8	Dougy	Tume	328330	dtume3@google.com	27 Grover Lane	Male	5
9	Neel	Strang	930467	nstrang4@icio.us	71 Bluestem Plaza	Male	3
10	Appolonia	McKelvey	208564	amckelvey5@youku.com	07 Farmco Center	Female	5
11	Frannie	Challice	571825	fchallice6@narod.ru	664 Killdeer Hill	Female	5
12	Filide	Baron	346136	fbaron7@vimeo.com	1712 Everett Avenue	Female	7
13	Corny	Le Frank	896599	clefrank8@netlog.com	547 Ryan Lane	Female	6
14	Valentina	Muddle	626808	vmuddle9@wikipedia.org	7 Corry Avenue	Female	5
15	Peyton	Pechold	596752	ppecholda@blog.com	48 Anderson Court	Male	5
16	Cynthie	Matusevich	871658	cmatusevichb@engadget.com	3405 Grim Court	Female	4
17	Andree	Chitter	899060	achitterc@cmu.edu	93999 Crest Line Trail	Female	3
18	Kaye	Sainsbury	429845	ksainsburyd@netvibes.com	8637 Lakeland Plaza	Female	7
19	Julietta	Kitto	337410	jkittoe@wufoo.com	00335 Burning Wood Terrace	Female	3

Student

student_id	first_name	last_name	gpa	birth_date	advisor	gender	grant_type	balance	major_id	email
754	Jessee	Dressel	1.34	2006-02-12	80	Male	SPT	96587	53	jdressel0@vistaprint.com
755	Colleen	Pymar	2.5	1991-09-21	89	Female	State	-81548	34	cpymar1@ning.com
756	Matthiew	Coaten	2.67	2006-01-20	73	Male	State	649814	50	mcoaten2@digg.com
757	Cele	Beldan	1.63	1991-09-06	81	Female	State	625917	22	cbeldan3@e-recht24.de
758	Kally	Keirle	3.99	2004-03-23	76	Female	SPT	586513	49	kkeirle4@engadget.com
759	Gisele	Inch	3.92	1990-04-28	75	Female	State	607212	51	ginch5@hatena.ne.jp
760	Robin	Brussell	2.13	1994-07-27	75	Male	State	670880	51	rbrussell6@shop-pro.jp
761	Isacco	Glavis	3.58	2005-08-10	87	Male	SPT	574943	3	iglavis7@webeden.co.uk
762	Gilly	Tzarkov	2.96	2001-09-01	85	Female	Paid	587291	9	gtzarkov8@4shared.com
763	Gates	Greason	2.95	2000-02-09	72	Female	Paid	350495	66	ggreason9@google.fr
764	Muffin	Pendrich	2.62	1997-02-15	72	Male	State	591236	6	mpendricha@cloudflare.com
765	Kin	Kimbell	3.84	1998-10-21	72	Male	Paid	32816	30	kkimbellb@businessinsider.com
766	Kata	Farington	2.05	2006-11-12	85	Female	SPT	316440	6	kfaringtonc@nationalgeographic.com
767	Arlena	Storrah	3.65	2000-10-21	84	Female	Paid	667269	3	astorrahd@craigslist.org
768	Quill	Tockell	2.07	2001-06-04	90	Male	State	572864	58	qtockelle@newsvine.com
769	Rosabella	Drover	2.44	1994-12-06	77	Female	SPT	72277	3	rdroverf@springer.com
770	Ive	Dinan	3.42	2003-06-12	84	Male	State	661208	50	idinang@seesaa.net
771	Vinnie	Hrinishin	2.24	1990-04-23	77	Female	SPT	180631	47	vhrinishinh@php.net
772	Aubine	Arnall	3.52	2005-12-24	73	Female	SPT	346033	66	aarnalli@apache.org

payment_id	student_id	amount	date
103	1105	525004	2020-03-07 00:00:00
104	1084	602406	2019-12-28 00:00:00
105	1012	508294	2020-09-10 00:00:00
106	982	494345	2020-07-07 00:00:00
107	880	376135	2022-12-04 00:00:00
108	838	337372	2021-06-30 00:00:00
109	1058	687364	2020-04-26 00:00:00
110	1079	463983	2020-10-22 00:00:00
111	890	669562	2022-11-02 00:00:00
112	1031	471702	2021-11-10 00:00:00
113	1144	302621	2020-04-19 00:00:00
114	1118	423912	2022-09-22 00:00:00
115	1109	694263	2021-04-18 00:00:00
116	782	644120	2022-01-22 00:00:00
117	833	655280	2020-03-10 00:00:00
118	997	538485	2020-03-12 00:00:00
119	1048	635577	2021-03-13 00:00:00
120	867	645378	2021-07-22 00:00:00
121	920	549255	2020-11-14 00:00:00
122	834	672176	2021-06-17 00:00:00

Payment

book_id	book_name	author	publish_year
1	Mat Lam Tam	Cordelia Cettell	2004
2	Temp	Evan Sevior	1987
3	Gembucket	Terrance Rowlatt	2003
4	Job	Feliza Cunningham	2005
5	Wrapsafe	Pammie Kobierra	1985
6	Daltfresh	Demetris Ivatts	1996
7	Konklux	Candace Bryer	2008
8	Rank	Benita Skrines	2009
9	Lotstring	Leoine Algore	2003
10	Stim	Marius Bernardino	2010
11	Regrant	Dedra Spottiswoode	2008
12	Trippledex	Roanna Bernardoni	2009
13	Prodder	Ramona Gaynor	1995
14	Viva	Clarette Crow	1990
15	Tempsoft	Christabel Champney	2003
16	Aerified	Vita Lillicrop	2000
17	Bitwolf	Mickie Anelay	2008
18	Trippledex	Jamal Dudney	2011
19	Tresom	Jo-ann Hinsche	2012
20	Bamity	Mikol Toffanini	2012

Book

Enroll

enroll_id	student_id	section_id	grade	absense	year	semester
1	791	199	B	49	2017	2
2	1087	49	A-	26	2020	1
3	964	295	C-	61	2022	2
4	826	181	B-	17	2017	2
5	942	195	A-	93	2022	2
6	928	210	B	79	2020	1
7	1112	280	B+	13	2018	1
8	988	121	FX	79	2017	2
9	882	272	B+	23	2017	2
10	897	122	C+	100	2019	2
11	1037	58	A	24	2020	1
12	789	84	F	97	2020	2
13	944	302	C+	63	2022	2
14	1096	275	A-	78	2022	2
15	1124	207	C	35	2017	1
16	904	271	B+	28	2020	1
17	921	27	F	49	2021	2
18	1045	102	B	45	2019	2
19	896	31	B+	94	2022	1
20	1033	173	C	32	2022	2

Index:

```
CREATE INDEX index_faculty_name
ON faculty (faculty_name);


CREATE INDEX index_degree
ON major (degree);


CREATE INDEX index_department_id
ON department (department_id);


CREATE INDEX index_InOut
ON get_entry (in, out);


CREATE INDEX index_name
ON student (first_name, last_name);


CREATE INDEX index_course
ON course (course_id, course_number);


CREATE INDEX index_bookname
ON book (book_name);


CREATE INDEX index_staffEmail
ON staff (email);


CREATE INDEX index_clubName_Head
ON clubs (club_name, head);


CREATE INDEX index_log
ON log(log_id, log_data, log_info);21:27
```

Query:

1)select course.course_name, course.course_number, course.credit, e.absense

from course, enroll e, student s, section sec

WHERE s.student_id = 754 and e.student_id = s.student_id and e.section_id = sec.section_id and sec.course_id = course.course_id;

$$\pi_{course.course\_name,\ course.course\_number,\ course.credit,\ e.absense}\ \sigma_{s.student\_id = 754\ AND\ e.student\_id = s.student\_id\ AND\ e.section\_id = sec.section\_id\ AND\ sec.course\_id = course.course\_id}\ (course \times \rho_{e}\ enroll \times \rho_{s}\ student \times \rho_{sec}\ section)$$

2) select COUNT(*) from student s, enroll e

where e.grade = 'A' and e.student_id = s.student_id;

$$\pi_{COUNT(*)}\ \gamma_{COUNT(*)}\ \sigma_{e.grade = "A"\ AND\ e.student\_id = s.student\_id}\ (\rho_{s}\ student \times \rho_{e}\ enroll)$$

3) select blacklist.untill_date, student.first_name, student.last_name

from blacklist INNER

JOIN student on blacklist.student_id = student.student_id;

$$\pi_{blacklist.untill\_date,\ student.first\_name,\ student.last\_name}\ (blacklist \bowtie_{blacklist.student\_id = student.student\_id} student)$$

4) CREATE VIEW Retake AS
SELECT s.student_id, e.section_id
FROM student s, enroll e
WHERE (e.absense > 30 OR e.grade = 'FX' OR e.grade = 'F') AND (s.student_id = e.student_id) ;

$$\pi_{s.student\_id,\ e.section\_id}\ \sigma_{e.absense > 30\ OR\ e.grade = \text{"FX"}\ OR\ e.grade = \text{"F"}\ AND\ s.student\_id = e.student\_id}\ (\rho_{s}\, student \times \rho_{e}\, enroll)$$

5)DELETE FROM borrow
WHERE EXISTS (SELECT b.student_id FROM borrow b, blacklist l l.student_id = b.student_id);

6) CREATE VIEW High_GPA AS
SELECT student_id
FROM student
WHERE gpa > 3.5;

7) SELECT book_id
FROM book
WHERE author = 'Evan Sevior'
UNION
SELECT book_id
FROM book
WHERE publish_year > 2000;
ORDER BY book_id;

$$\pi_{book\_id}\ \sigma_{author = \text{"Evan Sevior"}}\ book \cup \tau_{book\_id}\ \pi_{book\_id}\ \sigma_{publish\_year > 2000}\ book$$

8) SELECT s.student_id, st.email
FROM staff st, student s, blacklist b
WHERE s.advisor = st.staff_id AND b.student_id = s.student_id;

$$\pi_{s.student\_id,\ st.email}\ \sigma_{s.advisor = st.staff\_id\ AND\ b.student\_id = s.student\_id}\ (\rho_{st}\ staff \times \rho_{s}\ student \times \rho_{b}\ blacklist)$$

9) select COUNT(student_id)
from enroll
where section_id = 6;

$$\pi_{COUNT\ (student\_id)}\ \gamma_{COUNT\ (student\_id)}\ \sigma_{section\_id = 6}\ enroll$$

10) start TRANSACTION;
INSERT INTO payment(amount, student_id) VALUES(700000, 795);
COMMIT;

11) start TRANSACTION;
UPDATE student SET balance = balance - 70000 where student_id = 796;
ROLLBACK;

12)
select r.room_id, s.section_id
from room r, section s
where r.room_id = s.room_id AND s.time_start = '11:11:00';23:50

$$\pi_{r.room\_id,\ s.section\_id}\ \sigma_{r.room\_id = s.room\_id\ AND\ s.time\_start = "11:11:00"}\ (\rho_{r}\ room \times \rho_{s}\ section)$$

13) select staff.first_name, staff.last_name from staff where staff.staff_id = ANY(SELECT staff_id from instructor WHERE degree = 'PhD');

$$\pi_{staff\_id}\ \sigma_{degree = "PhD"}\ instructor$$

14) select s.section_id
from student st, section s, enroll e
where st.student_id = e.student_id AND e.section_id = s.section_id AND s.day = 'Friday';

$$\pi_{s.section\_id}\ \sigma_{st.student\_id = e.student\_id\ AND\ e.section\_id = s.section\_id\ AND\ s.day = "Friday"}\ (\rho_{st}\ student \times \rho_{s}\ section \times \rho_{e}\ enroll)$$

15) delete from section
where day = 'Saturday'

16) select count(*) from student where gpa=4.0

$$\pi_{COUNT(*)}\ \gamma_{COUNT(*)}\ \sigma_{gpa = 4.0}\ student$$

17) select min(gpa) from student

18) ALTER TABLE student
DROP COLUMN last_name;

-Triggers

1) CREATE TRIGGER add_member1 AFTER INSERT ON clubs

FOR EACH ROW INSERT INTO members(student_id, club_id) VALUES (new.head, new.club_id);

2) CREATE TRIGGER delete_student AFTER DELETE ON student
FOR EACH ROW INSERT INTO log VALUES(CURRENT_DATE(), 'student delated');

3) CREATE TRIGGER plus_gpa AFTER UPDATE ON enroll
FOR EACH ROW UPDATE student set gpa = gpa + 0.2 WHERE student_id = new.student_id;