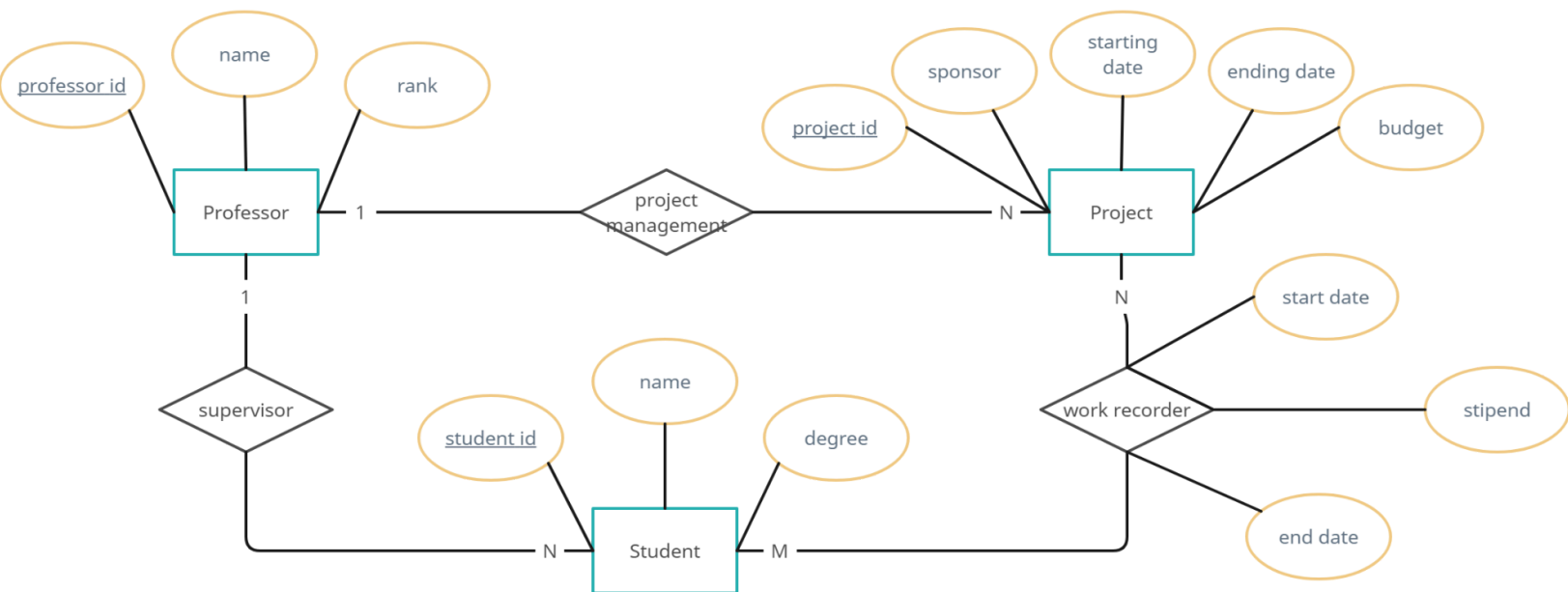


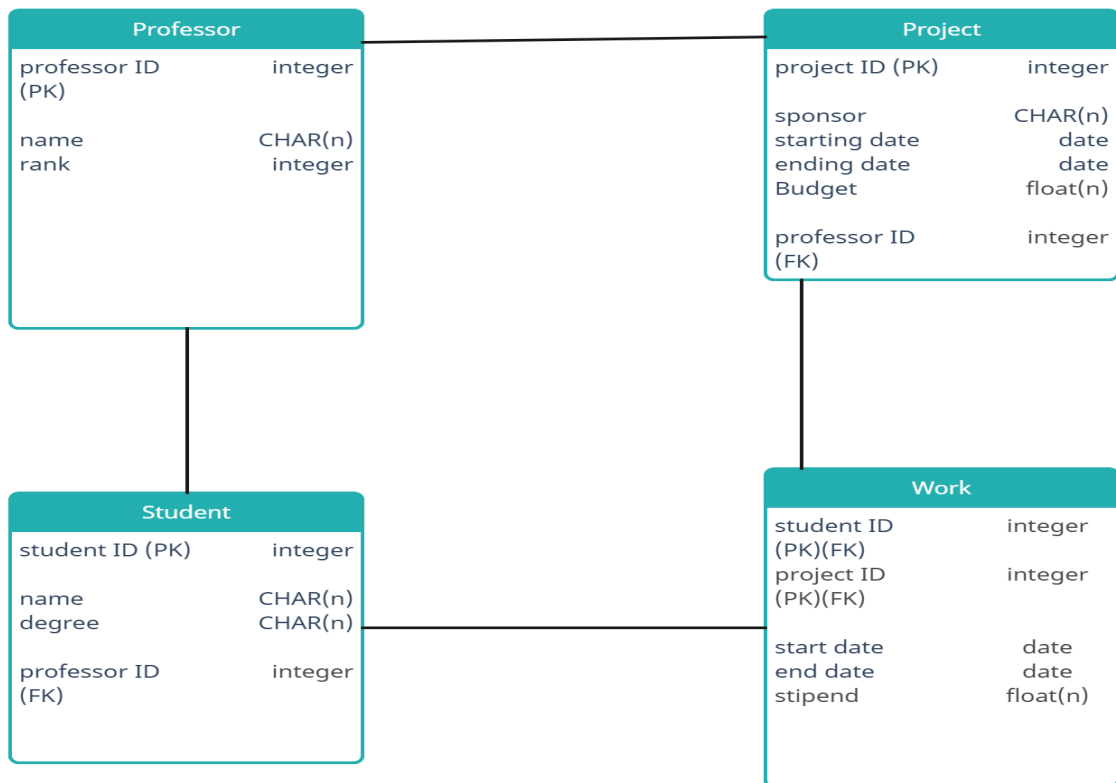
Problem 1 - ER Models, Relational Models, Normal Forms

ER Diagram



Assumed that only one sponsor can be assigned for a single project

Table



Relational schema

```
CREATE TABLE Professor (  
  professor_ID  INTEGER,  
  name  VARCHAR(20),  
  rank  INTEGER,  
  PRIMARY KEY (professor_ID)  
);  
CREATE TABLE Project (  
  project_ID  INTEGER,  
  professor_ID  INTEGER,  
  sponsor  VARCHAR(50),  
  start_date  Date,  
  end_date  Date,  
  price  NUMERIC,  
  PRIMARY KEY (project_ID),  
  FOREIGN KEY (professor_ID) REFERENCES Professor  
);  
CREATE TABLE Student (  
  student_ID  INTEGER,  
  professor_ID  INTEGER,  
  name  VARCHAR(20),  
  degree  VARCHAR(10),  
  PRIMARY KEY (student_ID),  
  FOREIGN KEY (professor_ID) REFERENCES Professor  
);  
CREATE TABLE Work (  
  student_ID  INTEGER,  
  project_ID  INTEGER,  
  start_date  Date,  
  end_date  Date,  
  stipend  NUMERIC,  
  PRIMARY KEY (student_ID, project_ID),  
  FOREIGN KEY (student_ID) REFERENCES Student,  
  FOREIGN KEY (project_ID) REFERENCES Project  
);
```

Problem 2 - Decomposition

Highlighted field names are primary keys.

First Normal form :

forum_name	popularity	post_id	title	article	reply
Gossiping	100	131	Girlfriend	How can I get girlfriend ?	Haha
Gossiping	100	131	Girlfriend	How can I get girlfriend ?	I don't know
Gossiping	100	252	Friends	I don't have a friend...	Haha
Gossiping	100	252	Friends	I don't have a friend...	I can be
Gossiping	100	252	Friends	I don't have a friend...	QQ
Joke	100	46	Knock	Knock! Knock! ...	Then?
Joke	23	46	Knock	Knock! Knock! ...	What's the point ?
Joke	23	151	Santa Claus	Hold! Hold! Hold!	XDD

Forum_name, post_id and reply forms a composite primary key.

Second Normal form :

Forum table

forum_name	popularity
Gossiping	100
Joke	23

Reply table

forum_name	post_id	reply	reply_id
Gossiping	131	Haha	1
Gossiping	131	I don't know	2
Gossiping	252	Haha	1
Gossiping	252	I can be	2
Gossiping	252	QQ	3
Joke	46	Then?	1
Joke	46	What's the point ?	2
Joke	151	XDD	1

Post table

forum_name	post_id	title	article
Gossiping	131	Girlfriend	How can I get girlfriend ?
Gossiping	252	Friends	I don't have a friend...
Joke	46	Knock	Knock! Knock! ...
Joke	151	Santa Claus	Hold! Hold! Hold!

Forum_name, post_id forms a composite primary key.

Third Normal form :

Forum table

forum_name	popularity
Gossiping	100
Joke	23

Title table

forum_name	post_id	title
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Gossiping	131	Girlfriend
Gossiping	252	Friends
Joke	46	Knock
Joke	151	Santa Claus

Forum_name and post_id form a composite primary key.

Article table

title	article
Girlfriend	How can I get girlfriend ?
Friends	I don't have a friend...
Knock	Knock! Knock! ...
Santa Claus	Hold! Hold! Hold!

Reply table

forum_name	post_id	reply	reply_id
Gossiping	131	Haha	1
Gossiping	131	I don't know	2
Gossiping	252	Haha	1
Gossiping	252	I can be	2
Gossiping	252	QQ	3

Joke	46	Then?	1
Joke	46	What's the point ?	2
Joke	151	XDD	1