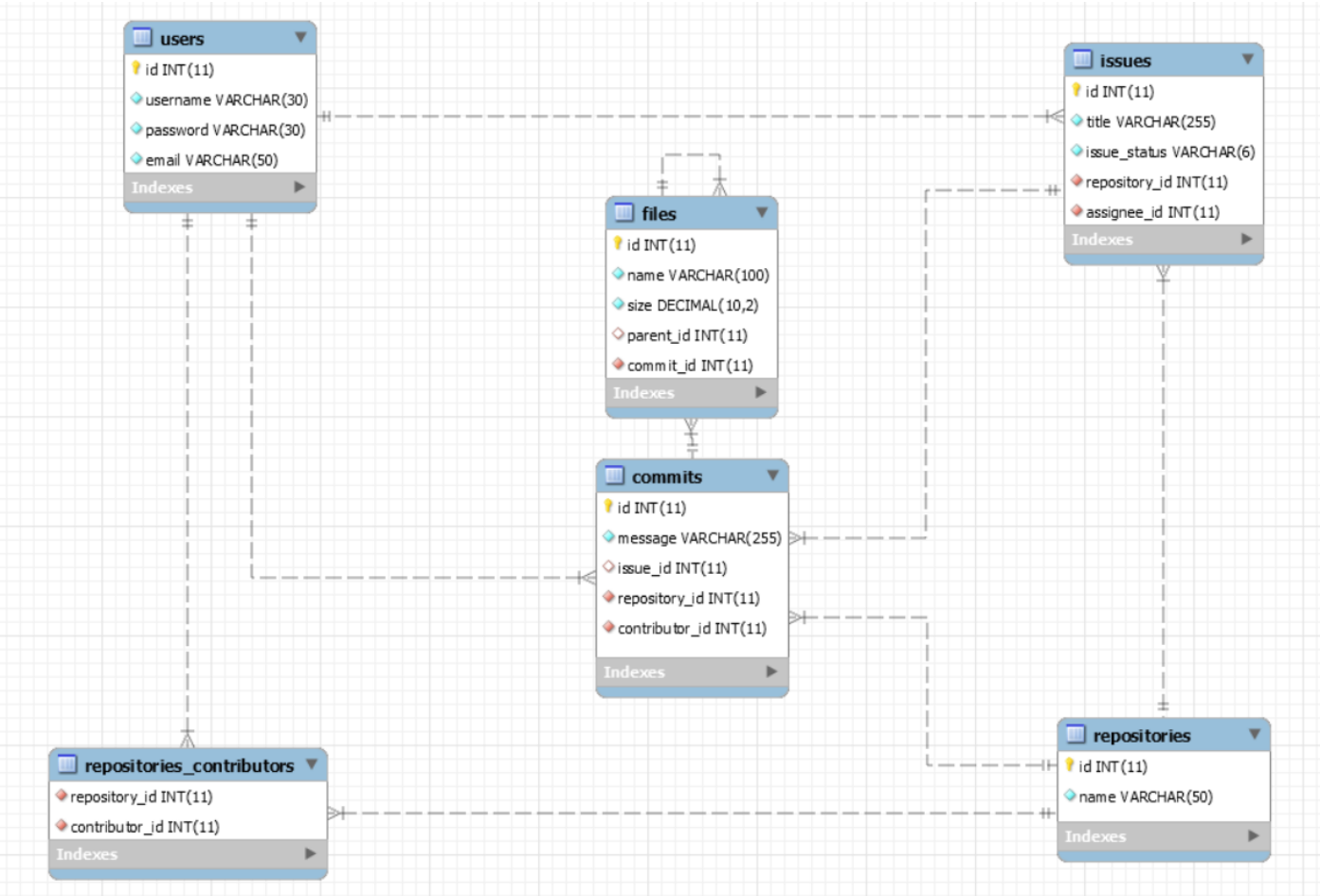
Database Basics (MySQL) Exam

Buhtig Source Control

You've most likely heard of Github. Well … There is a side project called "Buhtig" which is the back-up data of Github. You are one of the few selected to work in the multi-billion company, as one of the back-up database managers. You'll need to prove your skills by designing and manipulating data in the Instagraph prototype.

Section 0: Database Overview

You have been given an Entity / Relationship Diagram of the Buhtig Database:



The **Buhtig Database** needs to hold information about **users**, **repositories**, **issues**, **commits** & **files**.

Your task is to create a database called **buhtig**. Then you will have to create several **tables**.

- **users** – contains information about the **users**.
- **repositories** – contains information about the **repositories**.
- **repositories_contributors** – a **many** to **many mapping** table between the **repositories** and the **users**.
- **issues** – contains information about the **issues**.
  - Each **issue** has a **repository**.
  - Each **issue** has an **assignee** (**user**).
- **commits** – contains information about the **commits**.
  - Each **commit MAY** have an **issue**.
  - Each **commit** has a **repository**.
  - Each **commit** has a **contributor** (**user**).

- **`files`** – contains information about the **files**.
  - Each **`file`** **MAY** have a **`parent`** (**`file`**).
  - Each **`file`** has a **`commit`**.

Section 1: Data Definition Language (DDL) – 40 pts

Make sure you implement the whole database correctly on your local machine, so that you could work with it.

The instructions you'll be given will be the minimal needed for you to implement the database.

01. Table Design

You have been tasked to create the tables in the database by the following models:

users

Column Name	Data Type	Constraints
`id`	**Integer,** from **1** to **2,147,483,647.**	**Primary Key** **AUTO_INCREMENT**
`username`	A **string** containing a maximum of **30 characters**. Unicode is **NOT** needed.	**NULL** is **NOT** permitted. **UNIQUE** values.
`password`	A **string** containing a maximum of **30 characters**. Unicode is **NOT** needed.	**NULL** is **NOT** permitted.
`email`	A string containing a maximum of **50 characters**. Unicode is **NOT** needed.	**NULL** is **NOT** permitted.

repositories

Column Name	Data Type	Constraints
`id`	**Integer,** from **1** to **2,147,483,647.**	**Primary Key** **AUTO_INCREMENT**
`name`	A **string** containing a maximum of **50 characters**. Unicode is **NOT** needed.	**NULL** is **NOT** permitted.

repositories_contributors

Column Name	Data Type	Constraints
`repository_id`	**Integer**, from **1** to **2,147,483,647.**	Relationship with table **`repositories`**.
`contributor_id`	**Integer**, from **1** to **2,147,483,647.**	Relationship with table **`users`**.

issues

Column Name	Data Type	Constraints
`id`	**Integer**, from **1** to **2,147,483,647.**	**Primary Key** **AUTO_INCREMENT**
`title`	A **string** containing a maximum of **255 characters**. Unicode is **NOT** needed.	**NULL** is **NOT** permitted.
`issue_status`	A **string** containing a maximum of **6 characters**. Unicode is **NOT** needed.	**NULL** is **NOT** permitted**.**
`repository_id`	**Integer**, from **1** to **2,147,483,647.**	Relationship with table **`repositories`**. **NULL** is **NOT** permitted**.**
`assignee_id`	**Integer**, from **1** to **2,147,483,647.**	Relationship with table **`users`**. **NULL** is **NOT** permitted**.**

commits

Column Name	Data Type	Constraints
`id`	**Integer**, from **1** to **2,147,483,647.**	**Primary Key** **AUTO_INCREMENT**
`message`	A **string** containing a maximum of **255 characters**. Unicode is **NOT** needed.	**NULL** is **NOT** permitted.
`issue_id`	**Integer**, from **1** to **2,147,483,647.**	Relationship with table **`issues`**.
`repository_id`	**Integer**, from **1** to **2,147,483,647.**	Relationship with table **`repositories`**. **NULL** is **NOT** permitted**.**
`contributor_id`	**Integer**, from **1** to **2,147,483,647.**	Relationship with table **`users`**. **NULL** is **NOT** permitted**.**

files

Column Name	Data Type	Constraints
`id`	**Integer**, from **1** to **2,147,483,647.**	**Primary Key** **AUTO_INCREMENT**
`name`	A **string** containing a maximum of **100 characters**. Unicode is **NOT** needed.	**NULL** is **NOT** permitted.
`size`	**DECIMAL**, up to **10 digits**, **2** of which after the **decimal point**.	**NULL** is **NOT** permitted**.**
`parent_id`	**Integer**, from **1** to **2,147,483,647.**	Relationship with table **`files`**.
`commit_id`	**Integer**, from **1** to **2,147,483,647.**	Relationship with table **`commits`**. **NULL** is **NOT** permitted**.**

Submit your solutions in Judge on the first task. Submit **all** SQL table creation statements.

You will also be given a **`data.sql`** file. It will contain a **dataset** with random data which you will need to **store** in your **local database**. This data will be given to you so you will not have to think of data and lose essential time in the process. The data is in the form of **INSERT** statement queries.

Section 2: Data Manipulation Language (DML) – 30 pts

Here we need to do several manipulations in the database, like changing data, adding data etc.

02. Data Insertion

You will have to **INSERT** records of data into the **`issues`** table, based on the **`files`** table. For **`files`** with **`id`** between **46** and **50** (**inclusive**), **insert data** in the **`issues`** table with the **following values**:

- **`title`** – set it to **"`Critical Problem With {fileName}!`".** Where the **`fileName`** is the **name** of the **`file`**.
- **`issue_status`** – set it to "**open**".
- **`repository_id`** – **MULTIPLY** the **`id`** of the **`file`** by **2** and **DIVIDE** it by **3**.
  - **ROUND** the resulting value **UP**.
- **`assignee_id`** – the **`file`**'s **`commit`**'s **`contributor`**'s **`id`.**

03. Data Update

UPDATE all **`contributors`** to **`repositories`** which have the **same `id`** (**value**) as the **`repository`** they **contribute** to.

SET them as a **`contributor`** to the **`repository`** with the **lowest `id`** (by **value**) which has **no contributors**.

If there aren't any **`repositories`** with no **`contributors`** do nothing.

04. Data Deletion

Buhtig is all about activity, and activity is expressed in issues. Issues indicate the constant process of development. Naturally, inactive repositories are being treated as abandoned. **DELETE** all **`repositories`** which do **NOT have any `issues`**.

Section 3: Querying – 100 pts

And now we need to do some data extraction. **Note** that the **example results** from **this section** use a **fresh database**. It is **highly recommended** that you **clear** the **database** that has been **manipulated** by the **previous problems** from the **DML section** and **insert again** the **dataset** you've been given, to ensure **maximum consistency** with the **examples** given in this section.

05. Users

Extract from the database, all of the **`users`**.

ORDER the results **ascending** by **`user id`**.

Required Columns

- **`id (users)`**
- **`username`**

Example

id	username
1	UnderSinduxrein
...	...

06. Lucky Numbers

When a contributor has the same id as the repository he contributes to, it's a lucky number.

Extract from the database, all of the **`repositories`**, which have the **same id** as their **`contributor`**.

ORDER the results **ascending** by **`repository id`**.

Required Columns

- `repository_id`
- `contributor_id`

Example

repository_id	contributor_id
1	1
3	3
...	...

07. Heavy HTML

There are some pretty big HTML files in the Buhtig database… Unnaturally big. Extract from the database all of the **`files`**, which have **`size`**, **GREATER** than **1000**, and their **`name`** contains "**`html`**".

ORDER the results **descending** by **`size`**.

Required Columns

- `id (files)`
- `name`
- `size`

Example

id	name	size
49	compile.html	27402.59
...	...	...

08. Issues and Users

Extract from the database, all of the **issues**, and the **users** that are **assigned** to them, so that they end up in the following format:

{username} : {issueTitle}

ORDER the results **descending** by **issue id**.

Required Columns

- **id (issues)**
- **issue_assignee**

Example

id	issue_assignee
75	TheDivineBel : Critical bug in Controller.php ruins application when executed
...	...

09. Non-Directory Files

Some of the files are **Directories**, because they are a **parent** to **some file**. Try to find those, which aren't.

Extract from the database all of the **files**, which are **NOT** a **parent** to **any other file**.

Extract the **size** of the **file** and add "**KB**" to the **end** of it.

ORDER the results **ascending** by **file id**.

Required Columns

- **id (files)**
- **name**
- **size**

Example

id	Name	size
6	Controller.json	14034.87KB
...	...	...

10. Active Repositories

Extract from the database, the **top 5 repositories**, in terms of **count** of **issues** on them.

ORDER the results **descending** by **issues (count of issues)**, and **ascending** by **repository id**.

Required Columns

- `id (repositories)`
- `name (repositories)`
- `issues (count of issues)`

Example

id	name	issues
11	KartinaJS	5
...	...	...

11. Most Contributed Repository

Extract from the database, the **top 1 repository** in terms of **`count`** of **`contributors`**.

If there are **2 `repositories`** have the **same `count`** of **`contributors`**, **order** them **ascending**, by **`id`**.

Required Columns

- `id (repositories)`
- `name (repositories)`
- `commits (count of commits)`
- `contributors (count of contributors)`

Example

id	name	commits	contributors
22	Maxima	1	6

12. Fixing My Own Problems

Extract from the database, for every **`user`** – the **`count`** of **`commits`** he has on **`issues`** that were **assigned** to **him**.

ORDER the results **descending** by **`commits (count of commits)`**, and **ascending** by **`user id`**.

Required Columns

- `id (users)`
- `username`
- `commits (count of commits)`

Example

id	username	commits
1	UnderSinduxrein	1
...	...	...

13. Recursive Commits

Extract from the **database** all **`files`** which **are a `parent`** to **their `parent`**.

In other words, **`file`** "**a**" is a **`parent`** to **`file`** "**b**" and **`file`** "**b**" is a **`parent`** to **`file`** "**a**".

Extract the **`file name`** (but only the **`name`**, without the **`extension`**). If its "**`index.html`**" you have to extract "**`index`**", as "**`file`**".

Extract the **`count`** of **`commits`** which **hold** the **`full file name`** (with **`extension`**) in their **`messages`** as "**`recursive_count`**".

ORDER the results **ascending** by **`file (file name)`**.

Required Columns

- **`file (fileName)`**
- **`recursive_count`**

Example

file	recursive_count
Find	2
...	...

14. Repositories and Commits

Extract from the database, for every **`repository`** – the **`count`** of **`users`** that have **`committed`** to it.

NOTE: **1 `user`** may have **more** than **1 `commit`** on the **`repository`**.

ORDER the results **descending** by **`users`** (**`count of users`**), and **ascending** by **`repository id`**.

Required Columns

- **`id (repositories)`**
- **`name`**
- **`users (count of users)`**

Example

id	name	users
1	WorkWork	4
...	...	...

Section 4: Programmability – 30 pts

The time has come for you to prove that you can be a little more dynamic on the database. So, you will have to write several procedures.

15. Commit

Create a stored procedure **udp_commit** which accepts the following parameters:

- **username**
- **password**
- **message**
- **issue_id**

And checks the following things:

If the **username** does **NOT exist** in the **users** table:

Throw an exception with error code '**45000**' and message '**No such user!**'.

If the **password** does **NOT** match the **username** in the **users** table:

Throw an exception with error code '**45000**' and message '**Password is incorrect!**'.

If there is no **issue** with the given **id** in the **issues** table:

Throw an exception with error code '**45000**' and message '**The issue does not exist!**'.

If **all checks pass**, extract the **id** of the corresponding **user**, from the **users** table, then the **repository_id** of the **issue**, from the **issues** table, and **INSERT** a new **commit** into the **commits** table with the **extracted data**.

The **procedure** should also **update** the **issue**'s **status** to '**closed**'.

```
CALL udp_commit(
     'WhoDenoteBel',
     'ajmISQi*',
     'Fixed issue: Invalid welcoming message in READ.html',
     2);
```

Result

id	message	issue_id	repository_id	contributor_id
...	...	...	...	...
51	Fixed Issue: Invalid welcoming message in READ.html	2	34	6

16. Filter Extensions

Create a stored procedure **udp_findbyextension** which accepts the following parameters:

- **extension**

And extracts all **files** that **have** the **given extension**. (like **index.html** for example)

The procedure should **extract** the **file**'s **id**, **name** and **size**.

The **file**'s **size** should have "**KB**" attached to it as a **suffix**.

The **files** should be ordered **ascending** by **file id**.

```
CALL udp_findbyextension('html');
```

Result

id	caption	user
13	Beat.html	907.30KB
17	Login.html	2863.23KB
...	...	