Project Deliverable 1

DBMS - CSC 540

Team:

1. Abhinav Medhekar (amedhek)
2. Arjun Sharma (asharm33)
3. Kiran Krishnan Balakrishnan (kbalakr)
4. Samir Jha (sjha4)
5. Shibalik Mohapatra (smohapa3)

E-R Diagram:

The E-R diagram has been included as part of the zip submission.

Relational Model:

Professors

(

Professor_Id	INTEGER
Name	CHAR(20)
PRIMARY KEY (Professor_id)	

)

Description: This table holds information about Professors.

Functional Dependency: Primary Key dependency

This is in BCNF

Students

(

Student_Id	INTEGER
Name	CHAR(20)
PRIMARY KEY (Student_id)	

)

Description: This table holds information about Students.

Graduate AND Undergraduate COVER Students

Functional Dependency: Primary Key dependency

This is in BCNF

Graduate

(

Student_Id INTEGER

PRIMARY KEY (Student_id)

FOREIGN_KEY(Student_id) REFERENCES Students

)

Description: This table holds information about Graduate Students.

Functional Dependency: Primary Key dependency

This is in BCNF

Undergraduate

(

Student_Id INTEGER

PRIMARY KEY (Student_id)

FOREIGN_KEY(Student_id) REFERENCES Students

)

Description: This table holds information about Undergraduate Students.

Functional Dependency: Primary Key dependency

This is in BCNF

Courses

(

Course_id INTEGER

Course_name CHAR(20)

Start_date DATE

End_date DATE

Professor_id INTEGER

Primary Key (course_id)

Foreign Key (Professor_id) REFERENCES Professors

)

Description: This table holds information about Courses.

Functional Dependency: Primary Key dependency

This is in BCNF

Topics

(

Topic_id INTEGER

Name CHAR(20)

PRIMARY_KEY (Topic_Id)

)

Description: This table holds information about Topics.

Functional Dependency: Primary Key dependency

This is in BCNF

Course_Topics

(

Course_id INTEGER

Topic_id INTEGER

PRIMARY KEY(Course_id, Topic_id)

Foreign Key (Course_id) REFERENCES Courses

Foreign Key (Topic_id) REFERENCES Topics

)

Description: This table holds relationship between Courses and Topics. This is a many-to-many relationship.

This is in BCNF

Course_Students

(

Course_Id INTEGER

Student_Id INTEGER

PRIMARY KEY(Course_id, Student_Id)

Foreign Key (Course_id) REFERENCES Courses

Foreign Key (Student_Id) REFERENCES Students

)

Description: This table holds relationship between Courses and Students. This is a many-to-many relationship.

This is in BCNF

TA

(

Course_Id INTEGER

Student_Id INTEGER

PRIMARY KEY(Course_id, Student_Id)

Foreign Key (Course_id) REFERENCES Courses

Foreign Key (Student_Id) REFERENCES Graduate

)

Description: This table holds relationship between Courses and Graduate Student who acts as TA for the course. This is a many-to-many relationship.

The participation of course in TA is mandatory, i.e every course has one or more TAs as per description.

This is in BCNF

Exercises

(

Exercise_Id	INTEGER
Name	CHAR(20)
Deadline	TIMESTAMP
Total_Questions	INTEGER
Retries	INTEGER
Start_date	TIMESTAMP
End_date	TIMESTAMP
Points	INTEGER
Penalty	INTEGER
Scoring_policy	CHAR(10)
Mode	CHAR(10)
Course_Id	INTEGER
PRIMARY_KEY (Exercise_Id)	
Foreign Key (Course_id) REFERENCES Courses	

)

Description: This table holds information about Homework Exercises.

Functional Dependency: Primary Key dependency

This is in BCNF

Questions

(

Question_Id	INTEGER
Question_Text	CHAR(100)
Difficulty_level	INTEGER
Hint	CHAR(100)

Explanation CHAR(100)

Topic_id INTEGER

PRIMARY_KEY (Question_Id)

FOREIGN_KEY (Topic_id) REFERENCES Topics

)

Description: This table represents the Questions. It is a collection of questions.

Each question here belongs to only one topic.

Functional Dependency: Primary Key dependency

This is in BCNF

Exercise_Questions

(

Exercise_Id INTEGER

Question_Id INTEGER

PRIMARY KEY(Exercise_id, Question_Id)

Foreign Key (Exercise_id) REFERENCES Exercises

Foreign Key (Question_Id) REFERENCES Questions

)

Description: This table holds relationship between Exercises and Questions which are part of that exercise. This is a many-to-many relationship.

This is in BCNF

Question_Bank

(

Course_Id INTEGER

Question_Id INTEGER

PRIMARY_KEY (Course_Id, Question_Id)

Foreign Key (Course_id) REFERENCES Courses

Foreign Key (Question_Id) REFERENCES Questions

)

Description: This table holds relationship between Courses and Questions. This is a many-to-many relationship. The participation of Question in Question Bank is Mandatory.

This is in BCNF

Parameters

(

Param_Id INTEGER

Value CHAR(100)

PRIMARY KEY(Param_Id)

)

Description: This table represents the Parameters.

Functional Dependency: Primary Key dependency

This is in BCNF

Answers

(

Answer_Id INTEGER

Answer CHAR(100)

PRIMARY_KEY (Answer_Id)

)

Description: This table represents the Answers.

Functional Dependency: Primary Key dependency

This is in BCNF

Question_Param_Answers

(

Question_Id	INTEGER
Param_Id	INTEGER
Answer_Id	INTEGER
Correct	BOOLEAN

PRIMARY_KEY (Question_Id, Param_Id, Answer_Id)

Foreign Key (Question_Id) REFERENCES Questions

Foreign Key (Param_Id) REFERENCES Parameters

Foreign Key (Answer_Id) REFERENCES Answers

)

Description: This table represents the ternary relationship between question and parameters used and the answers associated to the question with parameters. This also has a boolean attribute Correct which identifies the correct and incorrect choices available.

Functional Dependency: Primary Key dependency

This is in BCNF

Attempt_Submission

(

Attempt_Id	INTEGER
Exercise_Id	INTEGER
Student_Id	INTEGER
Submission_time	TIMESTAMP
Points	INTEGER
Number_of_attempts	INTEGER

PRIMARY_KEY (Attempt_Id)

FOREIGN_KEY (Exercise_Id) REFERENCES Exercises

FOREIGN_KEY (Student_Id) REFERENCES Students

)

Description: This table represents the overall summary of attempts made by a particular student for a particular exercise.

Functional Dependency: Primary Key dependency

This is in BCNF

Submission_Result

(

Attempt_Id	INTEGER
Question_Id	INTEGER
Given_Answer	CHAR(100)
Param_Id	INTEGER
Correct	BOOLEAN

PRIMARY_KEY (Attempt_Id, Question_Id, Param_Id)

FOREIGN_KEY (Attempt_Id) REFERENCES Attempt_Submission

FOREIGN_KEY (Question_Id) REFERENCES Questions

FOREIGN_KEY (Param_Id) REFERENCES Parameters

)

Description: This table represents the results of individual questions for a particular attempt.

Functional Dependency: Primary Key dependency

This is in BCNF

Application Constraints:

- The application will only support three access controls for professors, teaching assistants, and students.
- A graduate student who is a TA for a particular course cannot enroll in the same course.
- The order and the parameter for questions for any homework exercise will be randomly generated for each student.
- The homework exercise can only be created by professors.
- Only Professor and TA can enroll a student to the respective course.
- Adaptive homework logic needs to be implemented on the basis of student's performance which will be consistent throughout the application as per the description.

- Triggers needs to be implemented to maintain the consistency of the application. For instance if an entry is made in the students table then the entry should be automatically made in the persons table.

Assumption and Tradeoffs:

1. A question can belong to only one topic. In case, a question belongs to more than one topic,we have to create multiple records. This is because, such a situation would occur rarely.
2. We discussed the possibility of making Parameter and Answer as weak entities to the Question. However, we decided against that to support reuse of parameters and answers for multiple questions. For ex: a parameter value of 2 can be reused for multiple questions.

Statement of Acknowledgement

We acknowledge that all necessary questions have been asked and clarified regarding the project description.