

GRADED HOMEWORK 3

Assigned: 10/7/2020

Group Portion Due: 10/19/2020 at 3:30 PM on Canvas

Individual Portion Due: 10/20/2020 at 11:59 PM on Canvas

No late submission of either the group portion or the individual portion will be accepted.

See the submission instructions at the end of the document. Read the "Group Graded Homework Grading Policy" posted on Canvas

PROBLEM 1:

Group Questions:

- 1.1. To verify whether Azure SQL can check for integrity constraint violations, using the relational database that you have created for Problem 2 in Graded Homework 2, write SQL statements that implement the following queries, run them on Azure SQL, and capture the error messages generated by Azure SQL:
 - a) One insertion query that violates the uniqueness of the primary key of a table.
 - b) One insertion query that violates the not-null value of the primary key of a table.
 - c) One insertion query, one deletion query, and one update query that violate the foreign key constraint of a table.
 - d) One retrieval query that violates the domain constraint of an attribute of a table.
- 1.2. Review the SQL file you have created for Problem 2 in Graded Homework 2, choose one table that should be indexed, write SQL statement(s) to create an index on that table, and rerun the queries that need to access the table and index. Provide your detailed explanations as to why you chose that table and that search key for indexing, whether that index is primary or secondary, and why you chose those queries to rerun.

Individual Questions:

Each group member will be assigned one version of the following question (asking to consider only query A, B, C, or D being the most frequent) randomly after the group portion of the homework is due (see the submission instructions at the end of the document). You must be ready to answer any of the versions of the following question on your own to submit the individual portion of the homework:

Consider the case when one of the queries from the list below is executed far more frequently than the other queries from Problem 2 (c) in Graded Homework 2:

- A) Find the names of all Juniors (slevel = JR) who are enrolled in a class taught by Johnson.*
- B) Find the names of all classes that either meet in room R128 or have five or more students enrolled.*
- C) For each Level (slevel), display the Level and the average age of students for that Level.*
- D) Delete all Seniors (slevel = SR).*

Does this new information change your group's answer for Problem 1.2 of this Graded Homework 3? Provide your detailed explanations as to why it does, or why it does not. If you argue for the change to the group's answer, make sure to explain which new table and/or which new search key should be used for indexing and whether the new index is primary or secondary. Provide the SQL statement(s) to create the new index. There is no need to execute the statement or any queries on Azure SQL.

PROBLEM 2 (Group Question, No Individual Question):

Write a **JAVA program** using JDBC and Azure SQL to implement the following options for the relational database that you have created for Problem 2 in Graded Homework 2:

1. *Insert the fid, fname, deptid, and salary of a new faculty member into table Faculty. The salary is computed based on the average faculty salary of his/her department (if the average faculty salary is greater than \$50,000 then the salary of the new faculty member will be equal to 90% of the average faculty salary; if the average faculty salary is less than \$30,000, then the salary of the new faculty member will be equal to the average faculty salary; otherwise, the salary of the new faculty member will be equal to 80% of the average faculty salary);*
2. *Insert the fid, fname, deptid, and salary of a new faculty member into table Faculty. The salary is computed to be equal to the average salary of every faculty member in the university except the faculty members working for a particular department;*
3. *Display the complete information of all faculty members;*
4. *Quit (exit the program).*

Requirements:

- The program terminates only when the user chooses Option 4.
- Each of Options 1 and 2 must be implemented as a Transact SQL Stored Procedure and the fid, fname, and deptid must be entered as the procedure parameter values at runtime when the procedure is called. No query processing logic to be done by the Java program, it must only take the user input, query the database and display the query results.
- For testing, execute Option 3 once before and after each execution of Options 1 and 2; and execute each of Options 1 and 2 at least three times with different values of fid, fname, and deptid and execute Option 4 at least one time to show that your program terminates correctly.
- The Java program and all the Transact SQL Stored Procedures must be commented properly.

PROBLEM 3 (Group Question, No Individual Question):

Given the following relational database table:

Patients(ID, name, symptom, days_in_hospital)

The following insertions are performed on the table *Patients*:

Insert record <20, Johnson, cough, 3>

Insert record <10, Black, fever, 5>

Insert record <30, Miller, fever, 10>

Insert record <70, Brown, fatigue, 2>

Insert record <60, Grant, headache, 4>

Insert record <50, Miller, nausea, 15>

Insert record <90, Brown, cough, 8 >

Assume each block in the *Patients* file can store up to 2 patient records. Do the following:

1. Assuming that *Patients* is organized as a heap file, show the contents of the file after the last insertion.
2. Assuming that *Patients* is organized as a sequential file with *days_in_hospital* as the ordering field, show the contents (i.e. the data values as well as the associated block/bucket/record addresses) of the file after the last insertion.
3. Assuming that *Patients* is organized as an index-sequential file on the search key *days_in_hospital* and assuming that the primary index, the secondary index on *ID*, and the secondary index on *name* have been

created, show the contents of *Patients*, the primary index, and the two secondary indices after the last insertion.

4. Given the index-sequential file organization as described in (3), explain step-by-step how the DBMS would conduct search on this file organization to answer the following SQL query:

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select name
from Patients
where ID between 30 and 60
```

SUBMISSION INSTRUCTIONS:

Group Portion:

- The homework answers (one submission per group) must be submitted to **Canvas by 3:30 PM, 10/19/2020**. The submission includes the following:
 - Solutions for Problem 1: two files: a) the SQL file that shows the queries for Problem 1.1., and the required explanations written as in-line comments, the SQL statement(s) for index creation, and the SQL queries that you chose to rerun for Problem 1.2.; and b) The PDF file that shows the screenshots of the Azure SQL execution of the SQL queries for Problem 1.1., and the Azure SQL creation of the index and the Azure SQL execution of the SQL queries that you chose to rerun for Problem 1.2. Use the file name convention HW3_Problem1_Group X where X is your group number;
 - Solutions for Problem 2: three files: a) a Java file (extension .java) containing the Java source program; b) an SQL file (extension .sql) containing the Transact SQL Stored Procedures; and c) a PDF file that shows the steps indicating that you have executed the program successfully (the output must be included). Use the file name convention HW3_Problem2_Group X where X is your group number;
 - Solutions for Problem 3: A single PDF file with typed solution for the Problem 3. No Azure SQL is required to solve Problem 3. Use the file name convention HW3_Problem 3_Group X where X is your group number.

Individual Portion:

- After the submission deadline of the group portion of this graded homework, and before the submission deadline of the individual portion of this graded homework, you will have to take a quiz on Canvas. The quiz will be open from 4:46 PM, Monday, October 19, 2020 to 11:59 PM, Tuesday, October 20, 2020. The quiz will contain one of the versions of the Individual Question for Problem 1. Once you open the quiz, you will have 60 minutes to submit your answer. You will have to upload one PDF document as your answer. The quiz will also ask you for your feedback on your group members (i.e. the scores you give to each of your group members on the group portion of this graded homework) as outlined in the “Group Graded Homework Grading Policy” document available on Canvas. If you do not provide the scores for your group members, then we assume that you give the same points (10 points) to each of your group members.

NOTES:

- The instructions for using JDBC and Transact-SQL are available on Canvas.
- If you have questions concerning your Azure SQL account, using JDBC, Transact SQL, or other questions about this homework, see one of your TAs during their office hours on Zoom. Their office hours and contact information are listed on Canvas.
- **Start this homework early to avoid last-minute system problems. No late submission will be accepted.**