GRADED HOMEWORK 3 (Maximum Points: 100 points)

Assigned: 10/6/2021 at 1:30 PM (CST); Due: 10/18/2021 at 11:59 PM (CST) on Canvas

Late submissions will be accepted until 11:59 PM (CST) on the date following the due date with 5% penalty. Any late submission after this time will not be graded.

PROBLEM 1:

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 (assuming all queries are approximately equally frequent), 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.

PROBLEM 2:

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 pid, pname, (estimated) years_of_experience, and age of a new performer into table Performer. Assume that the value of years_of_experience is not known and will be estimated using the current information in the database as follows: the years_of_experience value should be set to the average of the years_of_experience values for all performers with an age within +/- 10 years of the new performer's age. If there are no such performers, the new performer's years_of_experience should be set to 18 less than his/her age value. After these calculations, the years_of_experience value should be adjusted so that it is at least 0 and no more than the performer's age value.*
2. *Insert the pid, pname, (estimated) years_of_experience, and age of a new performer into table Performer. Assume that the value of years_of_experience is not known and will be estimated using the current information in the database as follows: the years_of_experience value should be set to the average of the years_of_experience values for all performers who have acted in a movie that was directed by a director with a user-given did (director id). If there are no such performers, the new performer's years_of_experience should be set to 18 less than his/her age value. After these calculations, the years_of_experience value should be adjusted so that it is at least 0 and no more than the performer's age value.*
3. *Display the complete information of all performers.*
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 pid, pname, age, and did (for option 2) must be entered as the procedure parameter values at runtime when the procedure is called. No option logic must be handled by the Java program. It must only be used for user input collection, database call to execute the stored procedure, and the result presentation.
- 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 pid, pname, and age; 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:

Given the following relational database table:
ComputerRepairSpecialists (name, certificateNo, city, price_per_hour)

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

Insert record <Johnson, 11, Yukon, $20>;
Insert record <Black, 33, OKC, $20>;
Insert record <Grant, 22, Norman, $15>,
Insert record <White, 77, OKC, $20>,
Insert record <Chapman, 44, Edmond, $20>,
Insert record <Ford, 66, Enid, $25>,
Insert record <Haas, 99, OKC, $20>,
Insert record <Hougen, 88, Yukon, $25>,
Insert record <Clinton, 55, Tulsa, $25>

Assume each block in the *ComputerRepairSpecialists* file can store up to 3 specialist records and *ComputerRepairSpecialists* is organized as a sequential file with *name* as the ordering field. Do the following:

1. Show the contents (i.e. the data values as well as the associated block/bucket/record addresses) of the file after the last insertion.
2. Assuming that *ComputerRepairSpecialists* is an index-sequential file on the search key *name*, show the contents of the primary index and the secondary index on *price_per_hour* after the last insertion.
3. Assuming that a B-tree index file on *certificateNo* with order 3 is created for *ComputerRepairSpecialists* and no two specialists have the same *certificateNo*, using the definition of the B-tree given in class, show the content of the B-tree index file after the last insertion.

SUBMISSION INSTRUCTIONS:

- The homework answers must be submitted to **Canvas by 1:30 PM, 10/18/2021.** The submission includes the following:
  - Solutions for Problem 1: two files: a) the SQL file that shows the required explanations written as in-line comments, the SQL statement(s) for index creation, and the SQL queries that you chose to rerun; and b) The PDF file that shows the screenshots of the Azure SQL creation of the index and the Azure SQL execution of the SQL queries that you chose to rerun. Use the file name convention HW3_Problem1_Your Last Name_Your First Name.
  - 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_Your Last Name_Your First Name.

- o Solutions for Problem 3: A single PDF file with the typed/diagrammed solution for the Problem 3. No Azure SQL is required to solve Problem 3. Use the file name convention HW3_Problem 3_Your Last Name_Your First Name.
- o Attach to the PDF file containing your answers for Problem 1 a cover page that contains the following information:

  NAME: <Write your name here>
  STUDENT ID: <Write your student ID here>
  GRADED HOMEWORK NUMBER: 3
  COURSE: CS/DSA 4513 - DATABASE MANAGEMENT
  SECTION: ONLINE
  SEMESTER: FALL 2021
  INSTRUCTOR: DR. LE GRUENWALD
  SCORE: <we will your total score for both problems 1, 2, and 3 here>>

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 concerning this homework, meet your TA during his office hours over Zoom or post your questions on Canvas. The TA's office hours and contact information are on the Home Page on Canvas.
- Start this project early to avoid last minute system problems. No late submission will be accepted.