Homework Assignment 6

Maximum earnable: 54 pt.
Due: 11:59PM, June 20, 2025

- Read the assignment carefully. *You will need to* ***write and execute several SQL queries****; and* ***submit the results of your queries***.
- You are **allowed to re-use any of the queries from the lecture slides** while developing solutions to the problems.
- This is an individual work; Please be clear with HGU CSEE Standard:
  - Submitting assignments or program codes written by others or acquired from the internet without explicit approval of the professor is regarded as cheating.
  - Showing or lending one's own homework to other student is also considered cheating that disturbs fair evaluation and hinders the academic achievement of the other student.
  - It is regarded as cheating if two or more students conduct their homework together and submit it individually when the homework is not a group assignment.
- **Use of ChatGPT or similar AI tools**: Students are prohibited from using ChatGPT or similar AI platforms to directly obtain solutions for this assignment. The intent of the assignment is to exercise your understanding and application of the course material. Leveraging AI tools to bypass this learning process is considered a breach of academic integrity. Any evidence of such behavior will result in penalties.
- When finished, submit your work to *LMS.*

1. (1 pt. each) Read the textbook Chapters 13, 14, and 5. Fill in the blanks with the correct answers.

(a) To acquire fast random access to tuples in a file, one can use a/an ( ) structure.

(b) An ( ) stores the values of the search-keys in sorted order and associates each search-key with the records that contain it.

(c) A ( ) is an index whose search key also defines the sequential order of the file.

(d) In a ( ), an index entry appears for only some of the search-key values.

(e) A ( ) is a statement that the system executes automatically as a side effect of a modification to the database.

(f) The SQL standard supports functions returning tables as results: such functions are called ( ).

2. Answer the following questions.

(a) (3 pt.) Give at least three example items that metadata or system catalog stores.

(b) (3 pt.) What are the main disadvantages of the index-sequential file organization?

3. Answer the following questions that are from the textbook exercise problem sets. You may refer to the Internet as well as the textbook for assistance; however, <u>your solution should contain your own ideas in your own language</u>.

(a) (3 pt.; Exercise 14.16) When is it preferable to use a dense index rather than a sparse index? Explain your answer.

(b) (3 pt.; Exercise 14.17) What is the difference between a clustering index and a secondary index?

(c) (3 pt.; Exercise 14.1) Indexes speed query processing, but it is usually a bad idea to create indexes on every attribute, and every combination of attributes, that are potentially search keys. Explain why.

(d) (4 pt. each; Exercise 14.3) Construct a B+tree for the following set of key values: (2, 3, 5, 7, 11, 17, 19, 23, 29, 31)
Assume that the tree is initially empty and values are added in ascending order. Construct B+trees for the vases where the number of pointers that will fit in one nodes is as follows:

i. Four
ii. Six
iii. Eight

(e) (3 pt. each; Exercise 14.18) For each B+tree of Exercise 14.3a (not b and c), who the steps involved in the following queries:

i. Find records with a search-key value of 11.
ii. Find records with a search-key value between 7 and 17, inclusive.

(f) (5 pt. each; Exercise 14.4) For each B+tree of Exercise 14.3, show the form of the tree after each of the following series of operations:

a. Insert 9.
b. Insert 10.
c. Insert 8.