W4111 – Introduction to Databases  
Sections 002, V002; spring 2022  
  
Homework 3a – Written Assignment

# Instructions

* The homework submission date/time is 2022-APR-17 at 11:59 PM.
* Submission format is a PDF version of this document with your answers. Place your answers in the document after the questions.
* The name of your PDF must be <UNI>\_S22\_W4111\_HW3a\_Written.pdf. For example, mine would be dff9\_S22\_W4111\_HW3a\_Written.pdf
* You must use the Gradescope functions to mark the location of your questions/answers in the submitted PDF. Failure to mark pages will cause point deductions. **Please, please read the countless Ed posts, TA produced instructions and videos, etc. to prepare your submission.**
* You can use online sources but you must cite your sources. You may not cut and paste text.
* Questions typically require less than five sentences for an answer. You will lose points if your answer runs on and wanders.  
    
  “Verbosity wastes a portion of the reader’s or listener’s life.”

# Questions

### Question 1: Relative to disk drives, briefly define the following terms:

* Seek time
* Rotational latency time
* Transfer time/data transfer rate

Answer:

### Question 2: Briefly explain logical block addressing and cylinder-sector-head addressing.

Answer:

### Question 3: Some databases only map data to/use outer sectors/cylinders of hard disk drive. Why?

Answer:

### Question 4: Briefly explain the elevator algorithm for disk I/O scheduling and how it may improve performance?

Answer:

### Question 5: Relative to database buffer management, briefly explain the following concepts:

* Cache hit/cache miss
* Pinned page/block
* Least recently used replacement algorithm

Answer:

### Question 6: Briefly explain the concepts of and differences between row-oriented storage and column-oriented storage. For each model, give an example of row access/query patterns that would benefit from the model.

Answer:

### Question 7: Provide one benefit and one disadvantage of variable length record management/organization relative to fixed length record management/organization.

Answer:

### Question 8: The sample database associated with the book has a *takes* relation/table – *takes(ID, course\_id, section\_id, semester, year, grade)* that associated students and courses/sections.

* How might table partitioning (storage) be beneficial for storing the rows in the table?
* What columns would the database use to partition the data?
* Why might the database partition the *takes* table but not partition the *student* and *section* tables?

Answer:

### Question 10: Briefly explain and give 2 examples of how the algorithm for mapping records/rows to file/disks blocks can significantly affect performance.

Answer:

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