Ryan Lockman: 101430670

Homework #5 – S14
CSC 3287 Database Systems Concepts
Due 3/9/20014 by midnight
Deliver by email to debra.parcheta@ucdenver.edu

Use the ER diagram for the Instrument Rental and Repair database (HW 3) to answer the following questions.

1. For each entity in the diagram, tell whether a record will have a fixed length or a variable length and state the reason why you believe that to be true.

-SCHOOL is of fixed length because each attribute has only so many characters allowed.
-STUDENT is of fixed length because each attribute has only so many characters allowed.
-DEPENDANT is of fixed length because each attribute has only so many characters allowed.
-TEACHER is of fixed length because each attribute has only so many characters allowed.
-INVENTORY is of fixed length because each attribute has only so many characters allowed.
-SHOP_CONTACT is of fixed length because each attribute has only so many characters allowed.

-REPAIR_SHOP is of varying length, each attribute is a fixed length besides Services. Because Services is multi valued there is not a limit on its size.
-WORK_FORM is of varying length, each attribute is a fixed length besides Comment. Because Comment is multi valued there is not a limit on its size.
-RENT_FORM is of varying length, each attribute is a fixed length besides Comment. Because Comment is multi valued there is not a limit on its size.
-INSTRUMENT is of varying length, each attribute is a fixed length besides Comment. Because Comment is multi valued there is not a limit on its size.
-REPAIR_SHOP is of varying length, each attribute is a fixed length besides Services. Because Services is multi valued there is not a limit on its size.
-RENT_LOG is of varying length, each attribute is a fixed length besides Teach_IDs and School_IDs. Because they are multi valued there is not a limit on their sizes.
-REPAIR_LOG is of varying length, each attribute is a fixed length besides Shop_IDs, Repair_Costs, Repair_Dates, and Repair_Comments. Because they are multi valued there is not a limit on their sizes.
-INSPECT_LOG is of varying length, each attribute is a fixed length besides Conditions, Inspectors and Inspect_Dates. Because they are multi valued there is not a limit on their sizes.

2. Calculate the record size R in bytes in the INSTRUMENT file. You will have to state your assumption for the data type and size of each attribute.

Size in Bytes	Assumptions
Serial_ID(8)	Serials are 8 numbers long.
Funder(20)	Funder, corporate or person, can have a name of up to 20 characters.
Year_Made(4)	Year_Made is a four digit year.
Size(4)	INSTRUMENT Size can be no more than 4 digits.
Classification(15)	INSTRUMNET Classification can be up to 15 characters.
Maker(20)	Maker, company or person name, can have up to 20 characters.
Model(8)	Model number is 8 numbers long.
Name(20)	Name of INSTRUMENT can have up to 20 characters.
Comment(dynamic)	Comment is dynamic in size.
Record(99)	Record totals to 99 bytes + Comment pointer

3. Assume that your disk has these parameters :
   - Block size B = 512 bytes
   - Interblock gap size G = 128 bytes
   - Number of blocks per track = 20
   - Number of tracks per surface = 400
   - A disk pack consists of 15 double-sided disks.

   Assume that the file INSTRUMENTs has r = 600 records.
   Suppose that only 75 percent of the INSTRUMENT records have a value for Model, 21 percent for LoanLocation and 66 percent for Comments.
   Each record has a 1 byte field type for each field in the record, plus the 1 byte deletion marker and a 1 byte end-of-record marker.
   We will use spanned record organization where each block has a 5 byte pointer to the next block. (This space is not used for record storage.)
   a. Calculate the average record length R in bytes.
   b. Calculate bfr and tell what bfr represents in this particular case.
   c. Calculate the number of blocks b needed for the file.

A. Average record length is 99 bytes

B. Bfr is the blocking factor of a file. Which calculates the average number of records per block.
Bfr = floor of (Block Size / Record Size)
= 512/99
= 5 average records per block

C. b = ceiling of (r/bfr)
= 99/5
= 20 number of blocks

4. What is the primary purpose(s) of a GOOD hashing algorithm?

The primary purpose for a good hashing algorithm is distributing records uniformly and minimizing collisions while not leaving too many unused spaces in the table. Less collisions mean less collision resolution and less overflowing. This provides better look up times because you don't have to goto the next array index because of a value already being hashed to the same index.

5. Estimate the size of the INSTRUMENT file after 5 years. State your “real world” assumptions about how many records per year will be added and why.

I would say that each semester 50 records would be added with a total of 100 records per year. The number 50 would mean 50 students rented an INSTRUMENT for that semester.

If each record is 99 bytes long, then 100 x 99 would equal 9900 bytes for 1 year. Then 5 years would total 9900 x 5, which would equal 49500 total bytes.