Due Date: Tuesday, 5th July 2022 (During DBMS Theory Class)

University of Engineering & Technology, Peshawar
Dept. of Computer Systems Engineering

Database Management System – Spring 2022

Assignment No. 3

PROBLEMS & EXERCISES

Q1. Study Lecture 12a: Relational Algebra & Calculus and Lecture 12b: Files Indexing & Query Processing.

Q2. For the lecture 12a: Relational Algebra & Calculus complete all the exercises given on Slide No. 25, 26, 27, 28, 29, 46, 47, 48, 49, and 50.

Q3. For the lecture 12b: Files Indexing & Query Management, answer the following question using the lecture slides:

A. File Organization and Indexing

1) List three alternative file organizations.
2) Define Index. How does Index organize records?
3) List at least four different selections supported by Index.
4) Specify three different ways information is stored by Index.
5) Discuss Hash based index.
6) Discuss B+ Tree Indexes and give an example.
7) State your observations for table given on slide no. 28 titled I/O Cost of Operations.
8) What is a clustered index? Give examples of clustered indexes?

B. Query Processing: Joins and Sorting

1) What DBMS must do to run queries fast?
2) List different sorting techniques used by DBMS.

3) How B+ trees (including Clustered & Unclustered) can be used for sorting?
4) Discuss external sorting with merge sort.
5) List four different join algorithms used by DBMS.
6) Discuss three different types of nested loops for joining tables.
7) How does sort-merge join works?
8) How does hash join works?

C. Query Optimization

1) Given the cost of different join methods on Slide No. 77, which method is fastest?
2) Define access path.
3) How does tree index perform matching?
4) How does hash index perform matching?
5) Given ***day<8/9/94 AND bid=5 AND sid=3,*** how does B+ tree index and hash index perform matching?
6) For
```
SELECT  S.sname
FROM  Reserves R, Sailors S
WHERE  R.sid=S.sid AND
   R.bid=100 AND S.rating>5
```
, draw RA tree & plan. What is cost of plan?
7) For same query given in part 6), draw plan with no index. What is cost of this plan? How this cost can be further reduced?
8) For same query given in part 6), draw plan with index. What is cost of this plan?
9) Write Slide No. 99 in your words.

Q4. GROUP ACTIVITY - For the lecture 12b: Files Indexing & Query Management, prepare 8-minute presentation on one of the following topics:

- **Query Processing: Joins & Sorting**
- **Query Optimization**

Good Luck