

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations (January 2020 Term)

Sub: **CSE 215** (Database)

Full Marks: 180 Section Marks: 90 Time: 2 Hours (Sections A + B)

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – AThere are **FOUR** questions in this section. Answer any **THREE**.**Q1.**

- a. Explain the ACID properties of a transaction with an example. Why are these properties essential for the concurrent execution of transactions? 10+5
- b. Two transactions are given as follows:
- Transaction T1 transfers the sum of 20% of balances of accounts A and B to account C 8+7
 - Transaction T2 transfers Tk. 2000 from account D to account C
- Prepare a concurrent schedule for the above two transactions and prove that the schedule is conflict serializable.

Q2.

- a. The size of an unsorted relation r-unsorted is 36 blocks (B1, B2, B3,, B36) and the memory size to external sort merge the relation is 4 blocks. Show the diagram to sort the relation using the external sort merge algorithm and store it in the database as r-sorted. Using the diagram, explain the total number of blocks transfer needed to sort the relation and store it into the database. 10+5
- b. The Employee Management System of an organization has the following relational schema: 8+7
- employee (e-id, name, date-of-birth, salary, street, thana, district, NID)
- Total employees are 40000 and the size of the employee relation is 4000 blocks. The primary index is e-id and secondary indices are name, district and NID. The heights of the indices e-id, name, district and NID are 4, 3, 2 and 4 respectively. The time to transfer 1 block is 0.5ms and the average seek time in the disk is 8ms. The number of tuples with salary = 50000 is 100 and district = 'Comilla' is 2000. Consider each tuple is in different block and non-overlapping.
- (i) Find the query costs using the indices for the
- SQL: SELECT * FROM employee WHERE salary = 50000 OR district = 'Comilla'
- (ii) Explain the algorithm you have used to process the SQL of Q2 (b).

Q.3

- a. Explain how the following queries will be executed using the sparse index shown in Figure 1. 15
- SELECT * FROM instructor WHERE id = 22222
 - SELECT * FROM instructor WHERE id = 99999
- b. Explain the deletion of records from 10101 to 22222 from instructor relation given in Figure 1 as per deletion algorithm of relation with sparse index. 15

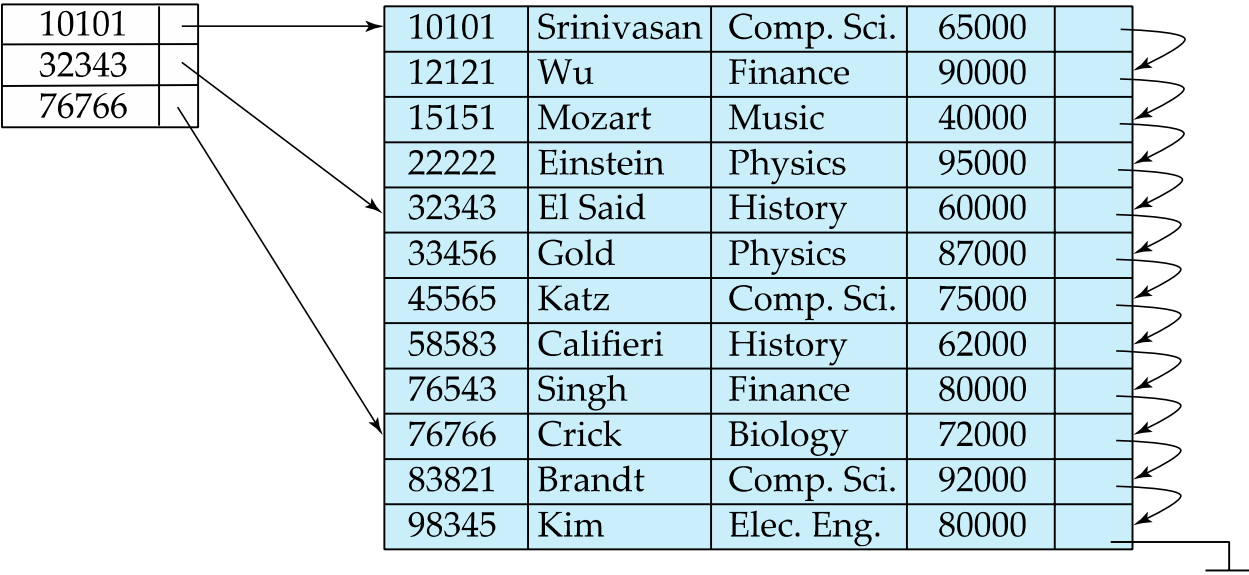


Figure 1: Sparse index and instructor relation for question 3(a) and 3(b)

Q.4

- a. Describe the storage mechanism, data read and update of data block for RAID level 5 storage with a set of 4 disks: D0, D1, D2 and D3; and a relation with 8 blocks: B0, B1, B2 B7. Describe the full recovery mechanism of all blocks of D1, if disk D1 fails.

10+5
- b. Given the relational schema as follows:

15

Student (id, name, DOB, cgpa, tot-cred, house-no, street, city, remarks, NID)
Takes (id, course-no, semester, year, grade)
Course (course-no, title, credit, pre-req)

The tuple size for Student, Takes and Course are 400, 100 and 80 bytes respectively. The block size is 8 KB (8000 Byte). Show the organization of slotted page structure after insertion of

- i. two tuples of Student,

ii. two tuples of Takes, and

iii. one tuple of Course.