The LNM Institute of Information Technology, Jaipur

CSE-220: Database Management Systems (DBMS)

Mid-Term II Examination (14th March 2014)

Time: 1 Hour **Total Marks: 30**

Instruction: Answer all the bits of a question in one place.

1. Consider the relation $R(A, B, C, D, E, F)$ with functional dependencies $\{B \rightarrow C, A \rightarrow D, F \rightarrow BE\}$ and answer the following questions. [1 + 4 + 3 = 8 M]
   a. What is/are the candidate key(s)?
   b. R is in which normal form and why? State the definition of each normal form that you are checking.
   c. Show whether $R1(A,D)$, $R2(B,F)$ and $R3(B,C,E,F)$ are a lossless decomposition of R or not.

2. Given a relation $R(A, B, C, D)$ with functional dependencies $S=\{A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C, AC \rightarrow D\}$, find the minimal cover of S. [6 M]

3. Consider a file having 20000 records of fixed length stored in an unspanned manner. Each record of the file has the following fields: *Name* (30 bytes), *RollNo* (8 bytes), *Address* (40 bytes), *DOB* (4 bytes), *Gender* (1 byte), *Dept* (1 byte), *Degree* (3 bytes). An additional byte is used as a deletion marker. Assume block size to be 512 bytes and block pointer to be 6 bytes long. Answer the following: [1 + 2 + 5 = 8 M]
   a. Calculate the record size.
   b. Calculate the blocking factor and number of file blocks.
   c. Suppose the file is ordered on the non-key field *Name* and we want to construct a secondary index on the key field *RollNo*. Calculate (i) the number of levels needed if we make it into a multi-level index and (ii) the total number of blocks required by the multi-level index.

4. Consider the relational schema given in *Figure 1* and write relational algebra expressions for the following queries. [8 M]
   a. Retrieve the names of all borrowers who do not have any books checked out.
   b. Retrieve the names, addresses, and number of books checked out for all borrowers who have more than five books checked out.
   c. For each book authored (or co-authored) by "Stephen King", retrieve the title and the number of copies owned by the library branch whose name is "Central".
   d. For each book that is loaned out from the "Sharpstown" branch and is published by "ABC" publisher and whose DueDate is 14/03/2014, retrieve the book title and the borrower's name.

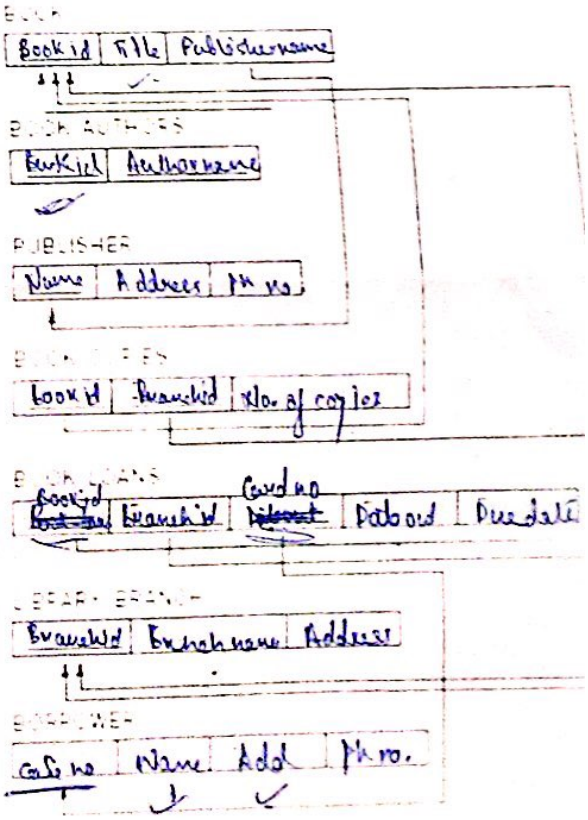

Figure 1. Relational schema