FILE ORGANIZATION AND DATABASE SYSTEMS: Class Test I

Instructions: 1. **Total Marks: 22 Duration 1 Hour (6.00 PM – 7.00 PM)**
2. Date: **21-02-2022**
3. **Write your answer in paper. Write your Roll Number, Name and upload pdf file in Microsoft Team**

1. A departmental store is consisting of a number of departments which sell various items. Each department has many employees. An employee can belong to at most one department. A manager is an employee who may look after more than one department but one department is looked after by only one manager. A unique number is assigned to every item by the store. Items are initially kept in the store and then distributed to different departments. A supplier may supply more than one item. One item is supplied by only one supplier at a time.

   i. Identify the entity sets and the corresponding attributes. Specify the key attributes of each entity set and the relationship among these entity sets.
   ii. Draw an ER diagram that captures the above information.
   iii. Write the relational model and draw the network model corresponding to the above ER diagram with proper justification.

   (1+3+3)

2. a) Discuss the importance of lossless join decomposition and preservation of dependency in the decomposition process of a relational scheme with the help of appropriate examples.
   b) Define the terms super key, candidate key, primary key and foreign key with example. If the foreign key of a relation R is the primary key of another relation S, will their join be lossless? Justify your answer.
   c) Find all the keys of the relational scheme R(A,B,C,D,E,G,H) with FDs { $AB \rightarrow C$, $AC \rightarrow B$, $AD \rightarrow E$, $B \rightarrow D$, $BC \rightarrow A$, $E \rightarrow G$}.
   Decompose this relation into a collection of BCNF relations if it is not in BCNF.

   (2+2+3)

3. a) For any two non-null relations R and S, express $R \div S$ in terms of basic relational algebra operators, where number of attributes of R is greater than the number of attributes of S and illustrate the result with one example.

   b) Consider the following schema of a hotel database with relations
   Hotel (Hotel_id, Hotel_name, location)
   Rooms (Hotel_id, Room_no, Type, Rent)
   Booking (Hotel_id, Room_no, Tourist_id, Entry_date, Departure_date)
   Tourist (Tourist_id, Tourist_name, Tourist_city).
   Express the following queries in Relational Algebra:
   i. Display the vacant room numbers of Hotel Park at Kharagpur on 21.02.2022.
   ii. Display the name of the tourists who have stayed at all the hotels located in Kharagpur.

iii. Find the name of the hotel whose deluxe type room rent is highest.

(2+4)

4. Define multi-valued dependency with appropriate example. If a relational scheme is not in 4NF, then write steps to decompose the relational scheme into 4NF.

(2)

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