Reg.No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)
END SEMESTER EXAMINATION, JUNE 2022

SUBJECT: DATABASE SYSTEMS [CSE 2251]

REVISED CREDIT SYSTEM

18/06/2022

Time: 180 Minutes **MAX. MARKS: 50M**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Consider the relations which records the loans taken by customers in different banks: (5M)

Bank(BName, HeadQuarters, Assets)
Customer(CID, CName, Address, DOB, Rating)
Loan(LID, CID, BName, Amount, Period, StartDate, Type)

Give SQL expressions for the following queries:

i. List the loan ID and Amount of the customer, Madhav, borrowed at Canara Bank.
ii. List the name of the customer(s) who have borrowed at least one loan from every bank.
iii. List the name of the customer(s) who has borrowed the maximum amount through one or more loans of any type.

1B. How can we test if an attribute is extraneous in a functional dependency? Given R(A,B,C,D,E) and its functional dependencies, F={A→BC; CD→E; B→D; E→A} compute the candidate keys for R? (3M)

1C. Why do we have to define Keys for a relation? Give an example of a super key, candidate key, primary key, and foreign key. (2M)

2A. Answer the following questions: (5M)

i. Consider you are constructing a video site similar to YouTube. Discuss the disadvantages of keeping video data such as actual video, metadata, tags, user views and so on in a file-processing system.

ii. Differentiate between two-tier and three-tier database architectures. Which architecture is better suited for Web applications? Justify your answers?

2B. How the scalar subquery is different from other subqueries? Give an example of scalar subquery on the University Database. (3M)

2C. List two reasons why null values might be introduced into the database? (2M)

3A. Consider the relation R (A, B, C, D, E, G) with the set functional dependencies as given below: (5M)

F = { AB → CD, A → B, B → C, C → E, BD→A }

i. Find all the candidate keys of R.

ii. Is R in BCNF? If not, then decompose it into BCNF.

3B. Suppose that we decompose the schema R (A, B, C, D, E) into (3M)

R1(A, B, C)

R2(A, D, E)

Show that this decomposition is a lossless decomposition if the following set F of functional dependencies holds: A → BC, CD → E, B → D, E → A. Check whether the decomposition is dependency-preserving or not and justify your answers.

3C. Consider a variable-length record representation, in which a null bitmap is used to indicate the attributes having null values. For variable length fields, if the value is null, what are the preferred values that could be stored in the offset and length fields? Justify your answers. (2M)

4A. An agro database has the following schema: (5M)

Crop(<u>CropName</u>, season)

Farmer (Fname, <u>FID, CropName,</u> YearlyIncome)

Land(<u>Acre, CropName, FID</u>)

Write the relational algebra expressions for the following queries:

i. Display the farmer details who own more than 10 acres of land in total.

ii. Identify the least earning farmer.

iii. List the names of the farmers who grow either Ragi or Paddy.

4B. Compute the canonical cover for a given relational schema R= (A ,B, C, D, E, F ,G, H) having a set of functional dependencies F = { A→B, ABCD→E, EF→GH, ACDF→EG}. (3M)

4C. Describe the types of query languages with an example for each. (2M)

5A. Explain the features of dense, sparse and multilevel indices. Mention the pros and cons for each with respect to a tuple insertion and deletion. (5M)

5B. Differentiate Static and Dynamic hashing and categorize the below given two hash functions into static and dynamic for a database containing 100 tuples: (3M)

i) Random number generator function

ii) Modulo 5 function

5C. Give any four differences between Indexing and Hashing techniques used in DBS. (2M)

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