Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

A Constituent unit of MAHE, Manipal

IV SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL- MAY 2019

SUBJECT: DATABASE SYSTEMS [CSE 2204]

REVISED CREDIT SYSTEM
(04/05/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. How can you check whether relation **B** is subset of relation **A** in SQL? Explain with an example **2M**

1B. Explain three different forms of natural outer join by showing the result of applying each of them on the relations course and prereq of University Database:

Relation course:

course_id	Title	dept_name	credits
BIO-301	Genetics	Biology	4
CS-190	Game Desgin	Comp. Sci.	4
CS-315	Robotics	Comp. Sci.	3

Relation prereq:

course_id	prereq_id
BIO-301	BIO-101
CS-190	CS-101
CS-135	CS-101

3M

1C. Consider the Bank Database where the primary keys are underlined.

branch (*branch_name*, *branch_city*, *assets*)
customer (*customer__name*, *customer_street*, *customer_city*)
loan (*loan_number*, *branch_name*, *amount*)
borrower (*customer_name*, *loan_number*)
account (*account__number*, *branch_name*, *balance*)
depositor (*customer_name*, *account_number*)

Write the following queries in SQL:

a. List the total loan amount of each branch
b. List the name of all the customers of the branch(es) that has the account with the maximum balance among all accounts of the bank
c. List the name of all the customers who have an account in all the branches but doesn't own a loan in any branch.

5M

2A. Consider the relational database given below where the primary keys are underlined. [Note:In Manager relation, both the attributes refer to person_name of Employee]

Employee(person_name,street,city)
Works(person_name,company_name,salary)
Company(company_name,city)
Manager(person_name,manager_name)

Write relational algebraic expressions for the following queries.

i. Find the names of all employees who live in the same city and on the same street as do their managers.

ii. Give all managers a 10 percent salary raise.
iii. Find the companies with least number of employees.
iv. Find those companies whose employees earn a higher salary, on average, than the average salary at small bank corporation. **5M**
v. Assume companies may be located in several cities(primary key of Company relation will be company_name and city). Find all companies located in every city in which small bank corporation is located.

2B. Construct an E-R diagram for Manipal Recording Studio with the following list of requirements. Identify the entities and relationships. Also mention the cardinality ratio and participation.

- Each musician that records at Manipal Studio has an SSN, a name, an address, and a phone number.
- Each instrument used in songs recorded at Manipal Studio has a unique identification number, a name (e.g., guitar, keyboard, flute) and a musical key (e.g., C, B-flat, E-flat).
- Each album recorded at Manipal Studio has a unique identification number, a title, a copyright date and a format (e.g., CD or DVD)
- Each song recorded at Manipal Studio has a title and a lyricist.
- Each musician may play several instruments, and a given instrument may be played by several musicians.
- Each album has multiple songs, but no song may appear in more than one album. If an album is deleted, you should not keep track of its songs any longer. Song title identifies a song uniquely within an album.
- Each song is performed by one or more musicians, and a musician may perform several songs.
- Each album has exactly one musician who acts as its producer. A musician may produce several albums. **5M**

3A. Explain what is canonical cover. Give an algorithm to compute canonical cover. Given schema R(A, B, C) and F= { $A \rightarrow BC$, $B \rightarrow C$, $A \rightarrow B$, $AB \rightarrow C$}, compute the canonical cover for F. **3M**

3B. Give an algorithm to compute closure of attribute set, α, under a set *F* of functional dependencies. Consider the following set *F* of functional dependencies on the relation schema *R* (*A, B, C, D, E, F*): *{A→BCD, BC→DE, B→D, D→A}.* Compute *B*+. **3M**

3C. Define BCNF and give an algorithm for lossless decomposition into BCNF schemas. Given: R (A,B,C,D,E,F,G,H) and F= { BE→GH; G→AF; D→C; F→B; GE→H } Give the BCNF decomposition using F(instead of F+). **4M**

4A. Explain the slotted page structure with a neat diagram. **3M**

4B. Suppose that we are using extendable hashing on a file that contains records with the following search-key values:
2, 3, 5, 7, 11, 17, 19, 23, 29, 31.
Show the extendable hash structure for this file if the hash function is h(x) = x mod 7 and each bucket can hold three records. **3M**

4C. Explain the B+-Tree Node Structure with a diagram. Describe the leaf nodes and non leaf nodes along with their properties. **4M**

5A. What is the functionality of storage manager? Explain its components and data structures it implements. **3M**

5B. Explain ACID property of a transaction taking 'customer reserving a flight seat' as an example. **4M**

5C. How is undo and redo operations done in transactions? Explain the undo and redo operations on recovery from failure. **3M**