Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

A Constituent unit of MAHE, Manipal

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

MAKE UP EXAMINATIONS, JUNE 2019

SUBJECT: DATABASE SYSTEMS [CSE 2204]

REVISED CREDIT SYSTEM
(19/06/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Explain with necessary examples, the use of SQL sub queries to perform tests for i. set membership, ii. making set comparisons, and iii. determining set cardinality **3M**

1B. What are scalar subqueries? Explain with an example. **2M**

1C. Consider the relations of University Database where the primary keys are underlined.

department(dept_name, building, budget)
course(course_id, title, dept_name, credits)
student(ID, name, dept_name, tot_cred)
takes(ID, course_id, sec_id, semester, year, grade)

Write the following queries in SQL.

i. List the names of students who have taken any course offered by "Physics" Dept.
ii. List the names of students who have taken all courses offered by "Physics" Dept.
iii. For each Department, list the name of student(s) along with the department name who have taken more than five courses of that Department.
iv. List the average number of courses taken per student. Take into account that if a student does not take any course, then that student does not appear in the *take* relation at all. **5M**

2A. Consider the below relational database, where the primary keys are underlined.

Movie(movieName, duration, category)
Directed_by(movieName, directorName)
Director(directorName, city, phone)

Give an expression in the relational algebra to express each of the following queries:

i. Find the phone numbers of all directors who have directed Sholay movie.
ii. Find count of movies directed by each director.
iii. Find the movies with most directors.
iv. Delete all movies directed by Yash.
v. Find the directors who have directed all the category of movies that Subash has directed. **5M**

2B. Design an ER diagram for database used by an IT training group to store information about its training program. Clearly indicate the entities, relationships, key constraints and participation. The Company has 12 instructors and can handle up to 100 trainees for each training session. The company offers 5 Advanced technology courses, each of which is taught by a team of 2 or more instructors. Each instructor is assigned to a maximum of two teaching teams. Each trainee undertakes one Advanced technology course per training session. (Assume at least 3 attributes for each of the identified entity set). **3M**

2C. Explain Aggregation in ER Model with an example. **2M**

3A. Consider the following relational schemas and set of functional dependencies. For each relation do the following:
i. R1 (A, C, D, B, E), and F={A→B, C→D}. Determine the candidate key.
ii. R2(A, B, C, D, E,G,H) and F ={CD → AB, C →D, D →EH, AE →C, A →C, B→D}. Compute the canonical cover of F. **4M**

3B. Explain the fourth normal form. Give the 4NF decomposition algorithm. **3M**

3C. Given a relation S(A, B, C, D) and functional dependencies for this relation schema are: AB →CD, B→C, AC→B. (i) Show that the relation is in 3NF but not in BCNF. (ii) Also decompose it into a collection of BCNF relations using F(not F^+). **3M**

4A. Consider the deletion of record 5 from the file of Figure 4A. Compare the relative merits of the following techniques for implementing the deletion:
a. Move record 6 to the space occupied by record 5, and move record 7 to the space occupied by record 6.
b. Move record 11 to the space occupied by record 5.
c. Mark record 5 as deleted and move no records.

record 0	10101	Srinivasan	Comp.Sci	65000
record 1	12121	Wu	Finance	90000
record 2	15151	Mozart	Music	40000
record 3	22222	Einstein	Physics	95000
record 4	32343	El Said	History	60000
record 5	33456	Gold	Physics	87000
record 6	45565	Katz	Comp.Sci	75000
record 7	58583	Califeri	History	62000
record 8	76543	Singh	Finance	80000
record 9	76766	Crick	Biology	72000
record 10	83821	Brandt	Comp.Sci	92000
record 11	98345	Kim	Elec.Eng	80000

Figure 4A.

3M

4B. Explain with examples the index update done in Dense and Sparse indices during insertion and deletion. **3M**

4C. Give pseudocode for insertion and deletion of entries into an extendable hash structure. **4M**

5A. Briefly explain the disadvantages of keeping the organizational information in file processing systems. **3M**

5B. Explain the concept of conflict serializability with an example. **4M**

5C.

(a)
<T_0 start>
<T_0, A, 1000, 950>
<T_0, B, 2000, 2050>

(b)
<T_0 start>
<T_0, A, 1000, 950>
<T_0, B, 2000, 2050>
<T_0 commit>
<T_1 start>
<T_1, C, 700, 600>

(c)
<T_0 start>
<T_0, A, 1000, 950>
<T_0, B, 2000, 2050>
<T_0 commit>
<T_1 start>
<T_1, C, 700, 600>
<T_1 commit>

Figure 5C.

Considering the above snapshot of the log at three different instances of time. List out the recovery actions for each of the case above with respect to immediate DB modification recovery. **3M**