Reg. No.



A Constituent unit of MAHE. Manipal

MANIPAL

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

MANIPAL INSTITUTE OF TECHNOLOGY

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: DATABASE SYSTEMS [CSE 2204]

REVISED CREDIT SYSTEM (27/04/2018)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL FIVE questions.
- ✤ Missing data may be suitable assumed.
- 1A. Assume a small shopkeeper wants to maintain his daily business data and asked your suggestion whether he could use EXCEL sheet or MS Access for the same. Give your 2M recommendation with justification
- 1B. What is the role of storage manager in database systems? Explain the functionalities of different storage manager components. Also, specify the purpose of different data structures, the storage manager implements as a part of physical system implementation.
- **1C.** Consider the following schema: suppliers(sid: integer, sname: string, address: string) parts(<u>pid</u>: integer, pname: string, color: string) catalog(sid: integer, pid: integer, cost: real)

The key fields are underlined, and the domain of each field is listed after the field name. Therefore sid is the key for Suppliers, pid is the key for Parts, and sid and pid together form the key for Catalog. The Catalog relation lists the prices charged for parts by Suppliers. Write the following queries in relational algebra

- i. Find the names of suppliers who supply some red part.
- ii. Find the *pids* of parts supplied by at least two different suppliers
- iii. Find the *sids* of suppliers who supply every part.
- **2A.** Consider the Bank Database schema:

branch (<u>branch_name: string</u>, branch_city: string, assets: real)

account (account_number: integer, branch_name: string, balance: real)

depositor (customer_name: string, account_number: integer, customer_city: string)

The key fields are underlined, and the domain of each field is listed after the field name. Therefore branch_name is the key for branch, account_number is the key for account, and customer_name and account_number together form the key for depositor. The depositor relation lists the customer name(s) for each account

Write the following queries in SQL.

- i. List in alphabetic order the names of all customers having an account in Gandhinagar branch
- ii. Find all branches that have greater total account balance than Jayanagar branch
- iii. Find all branches, of Bangalore city, which has an account of all the customers located in Bangalore.

4M

- 2B. What are the different aggregate functions supported in SQL? How they are used along with group by and having clauses. In what way the NULL values effect aggregate functions? Illustrate with necessary examples using *Instructor(ID, name, dept_name, salary)* relation in University database.
- **2C.** What are the different join types and join conditions SQL supports? Illustrate each of them with an example by considering *course(<u>course_id</u>, title, dept_name, credits)* and *prereq(<u>course_id</u>, prereq_id)*, the relations of University database.
- **3A.** List the mapping rules by which a database that conforms to an ER diagram can be represented by a collection of relational schemas. Map the E-R diagram in Figure 3A into an appropriate set of relations.



Fig. 3A

- **3B.** With necessary examples, briefly explain the two types of ordered indices namely dense and sparse indices. **3M**
- **3C.** Suppose that we are using static hashing on a file that contains records with the following search-key values:

10, 4, 5, 7, 12, 17, 20, 23, 29, 31, 28, 15

Give the static hash structure for this file if the hash function is $h(x) = x \mod 8$ and buckets can hold three records. Also, show how the static hash structure changes as the result of each of the following steps: **3M**

- a Insert 13.
- b. Insert 21.
- d. Delete 28.
- e. Delete 23.

3M

4A. What is a functional dependency? What are the goals of database design with functional dependencies? List the functional dependencies that the relation instance in Fig. 4A satisfies?

	XY	ZZ						
	x1 y	1 z1		3M				
	x1 y	1 z2						
	x2 y	1 z1						
	x2 y	1 z3						
	Fig. 4A							
4B.	Give an algorithm for each of the following:			2М				
	i. Closure of a set of functional dependenc	cies ii	. Closure of attribute sets	SIVI				

4C. Consider the following set F of functional dependencies on the relational schema CAR_SALE (Car_id, Option_type, Option_listprice, Sale_date, Option_discountedprice):

 $CarID \rightarrow Sale date$

Option_type \rightarrow Option_listprice

CarID, Option_type \rightarrow Option_discountedprice

The relation refers to options installed in cars (e.g., cruise control) that were sold at a dealership, and the list and discounted prices of the options.

- i. list the candidate keys for CAR_SALE
- ii. Test whether CAR_SALE is in 3NF. If not decompose it into 3NF.
- iii. Show that the decomposed relations in step ii are lossless and dependency **4M** preserving
- **5A.** Explain the data structure used in extendable hashing, one form of dynamic hashing.
- 5B. What is a serializable schedule? Why a serializable schedule is considered correct? Give the conflict equivalent serial schedule, if any, for the following schedules given in Table 5B. Table 5B.

Tuore o'B.								
Schedule S1			Schedule S2					
T1	T2		T1	T2				
Read(A)			Read(A)					
Write(A)				Write(A)				
	Read(A)		Write(A)					
Read(B)								
	Write(A)							
Write(B)								
	Read(B)							
	Write(B)							

3M

4M

3M

5C. Why the checkpoints are introduced in the log? How the checkpoint operation is performed? How the checkpoint record in the log allows the system to streamline its recovery procedure? Explain with an example