Total number of printed pages: **UG/4th /UCSE404**

2023

Database Management Systems

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	Consider the following set F of functional dependencies for relation schema R= (A, B, C, D, E). F={A→BC, CD→E, B→D, E→A} List all the candidate keys for R.	9
	b)	Show an example: if we remove attributes from the left and right sides of the Function dependency, then FD becomes strong and weaker respectively.	6
	c)	Show a scenario where a relational instance is in 3NF and still has the problem of redundancy.	5
2.	a)	Consider the relational schema R=(A,B,C, D, E, F, G, H, I) Let the set of functional dependencies F={A→BCD, E→A, F→GH} Is it in BCNF? If not decomposed in such a way that all decomposed relation is in BCNF.	10
	b)	Construct an E-R diagram for a car insurance company whose customers own one or more cars each. Each car has associated with zero to any number of recorded accidents. Each insurance policy covers one or more cars and has one or more premium payments associated with it. Each payment is for a particular period and has an associated due date and the date when payment was received.	10
3.	a)	Differentiate the following with respect to Specialization/Generalization i. Total and partial participation constraints with examples. ii. Disjoint and overlapping constraints with examples.	6
	b)	Define super key, candidate key, primary key, and foreign key concepts	6

		with examples.	
	c)	What is ACID property of a transaction? During its execution, a transaction passes through several states, until it finally commits or aborts. List all possible sequences of states through which a transaction may pass.	3+5=8
4.		person (**driver_id**, name, address) car (**license**, model, year) accident (**report_number**, date, location) owns (**driver_id, license**) participated (**report_number, license**, driver_id, damage_amount) Fig. 1 Consider the database of Figure 1, where the primary keys are underlined. Construct the following SQL queries for this relational database i. Find the total number of people who owned cars that were involved in accidents in 2009. ii. Find the number of accidents in which the cars belonging to "John Smith" were involved. iii. Find the name of the person who has a model "ABC" car in the year 2022. iv. Find the average damage amount of all the reported accidents. v. Find the name of the person who owns the car of the model name having 5 characters and starts with H.	4*5=20
5.	a)	Explain the 2-tier and 3-tier architecture.	4
	b)	Consider the following schema : Suppliers (**Sid** , Sname, address) Parts (**Pid**, Pname, color) Catalog (**Sid, Pid**, cost) The key field is underlined. The catalog relation lists the prices charged for parts by suppliers. Write the following queries in A. Relational Algebra B. Tuple Relational Calculus i. Find the sid of suppliers who supply some red or green parts. ii. Find the sid of suppliers who	6*2=12

		supply some red part or staying at "104 Radisson park".	
	c)	Explain two deadlock-prevention schemes based on timestamps.	4
6	a)	Can we combine the relational schema of the entity set and relationship set in ER diagram for relational model conversion? If yes, explain all the cases with examples.	6
	b)	What is a recoverable schedule? Why is the recoverability of schedules desirable? Give an example of a non-recoverable schedule.	6
	c)	What is conflict and view serializable? What is a Precedence graph? In what condition we may draw an arc from Ti to Tj(Ti→Tj)?	4+1+3=8
7.	a)	What benefit does rigorous two-phase locking provide? How does it compare with other forms of two-phase locking?	4
	b)	In multiple-granularity locking, what is the difference between implicit and explicit locking?	4
	c)	Explain the functions of a Database administrator.	4
	d)	"Deadlock schedule is preferable compared to the inconsistency" Yes or No: Justify your answer.	4
	e)	What is query optimization? What is a query evaluation plan?	4