USN

RV COLLEGE OF ENGINEERING®
(An Autonomous Institution affiliated to VTU)
V Semester B. E. Examinations September-2023
Computer Science Engineering
DATABASE DESIGN

Time: 03 Hours   *Maximum Marks: 100*
Instructions to candidates:
1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6.

PART A

1	1.1	What is metadata in database?	02
	1.2	Specify the ER notations for the different categories of attributes.	02
	1.3	If clauses $HAVING, GROUP\ BY, WHERE, ORDER\ BY$ used, choose in $SELECT$ statement then correct order is _____.	02
	1.4	List out the different types of join operation in SQL.	02
	1.5	What is the use of Normalization?	01
	1.6	A relation $R(A, B, C, D)$ having two FD sets $FD1 = \{A \Rightarrow B, B \Rightarrow C, AB \Rightarrow D\}$ and $FD2 = \{A \Rightarrow B, B \Rightarrow C, A \Rightarrow C, A \Rightarrow D\}$. Check whether FD1 is equivalent to $FD2$.	02
	1.7	List out the desirable properties of transactions.	02
	1.8	Let $F = \{A \rightarrow B, AB \rightarrow E, BG \rightarrow E, CD \rightarrow I, E \rightarrow C\}$. Find the closures of A^+ and $(AE)^+$.	02
	1.9	Does Elastic Search have a schema? Justify your answer.	01
	1.10	Differentiate between SQL and $NoSQL$ database.	02
	1.11	List out the different Concurrency problems in $DBMS$ transactions.	02

PART B

2	a	Describe the three schema architecture. Why do we need mappings between schema levels? How do different schema definition languages support this architecture?	08
	b	Discuss the main characteristics of the database approach and how it differs from traditional file systems	08
3	a	Consider the following set of requirements for a Blood Bank Management system and draw an ER diagram for this application. A blood bank stores blood of various blood groups. Many donors donate blood, each of different blood group/type. A donor may donate blood more than once and he is identified by a donor id (DID), name, sex, age, address and phone number. The blood donated by the donor is characterized by blood type, code and cost. Before each donor donates his blood, he is required to register himself as a donor with the receptionist who works at the Blood Bank. The receptionist is identified by employee id, name, address and	

		phone number. The Blood Bank receives order for blood from many hospitals for emergency purposes and other surgical requirements and each blood bank issues same of requires blood type. Each blood bank has its own blood bank number (*BNO*), issues, orders and blood types stored. The Blood Bank is managed by the blood bank manager who is identified by employee id, name, email_id and phone number. He is responsible for the proper management of the blood bank. The hospitals are identified by name, address and phone number.	10
	b	Develop the relational schema for the *ER* model of a Blood Bank database specified in Question No. 3a. Specify the primary and foreign keys.	06

OR

4	a	Generate the relational algebra for the following queries, considering the following tables of a database.
		 author(<u>author_id</u>, first_name, last_name)
		 author_pub(<u>author_id, pub_id,</u> author postion)
		 book(<u>book_id</u>, book_title, month, year, author_id_editor)
		 pub(<u>pub_id</u>, title,book_id)
		     i) List the titles of the book whose book id is greater than 10.
		     ii) List the names of all authors.
		     iii) List out all the books authored in the month of August.
			06

	b	Consider the following relations for a *RESORT* database.
		 $RESORT(resort\_no, res\_name, res\_type, res\_addr, res\_city, numsuite)$
		 $SUITE(suite\_no, resort\_no, suiteprice)$
		 $RESERVATION(reser\_no, resort\_no, visitor\_no, checkin, checkout, total\_visitor, suite\_no)$
		 $VISITOR(visitor\_no, firstname, lastname, visitor\_addr)$
		     i) Find the primary and foreign keys for the above relations.
		     ii) Insert any two tuples into the above relations such that integrity constraints are not violated.
		     iii) Perform the *INSERT* operation for any of the above relations such that Key Constraint, Referential integrity and Entity Integrity is violated. Justify your answer.
			10

5	a	Let the following relations schemes be given:
		 $Person(Id, name, age, gender, JobId, cityId)$
		 $Job(JobId, JobName)$
		 $City(cityId, cityName)$
		 Write *SQL* Queries that is equivalent to the following queries:
		     i) $\pi_{name}(\sigma_{age>40 \ V \ name=John}(Person)$
		     ii) $\sigma_{id>4 \ \wedge \ age=40}(Person)$
		     iii) $\pi_{name,gender}(\sigma_{cityName=Bnagalore}(Person * City))$
		     iv) $\sigma_{user.occupationID=Occupation.occupationID}(Person * Job))$
		     v) $\pi_{name}(\sigma_{gender=F \ \wedge \ JobName=Accountant}(Person * Job))$
			10

	b	Explain the different normal forms (inf, *2NF* and *3NF*) with an example for each.	06

OR

6	a	Discuss Project-Join normal form with an example.	10
	b	Explain Correlated Nested Queries with an example.	06

7	a	Discuss the features of MongoDB database.	08
	b	Write short notes on Elastic search.	08
8	a	Consider the three transactions $T1, T2$ and $T3$ and the schedule $S1$ is given below. Draw the serializability (precedence) graphs for $S1$ and $S2$ and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedules. $T1: r1(X); r1(Z); w1(X)$ $T2: r2(Z); r2(Y); w2(Z); w2(Y)$ $T3: r3(X); r3(Y); w3(Y)$ $S1: r1(X); r2(Z); r1(Z); r3(X); r3(Y); w1(X); w3(Y); r2(Y); w2(Z); w2(Y)$	08
	b	How does a $DBMS$ detect and resolve deadlocks?	08