USN

RV COLLEGE OF ENGINEERING®
(An Autonomous Institution affiliated to VTU)
V Semester B. E. Examinations Apr-2024
Computer Science and 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

			M	BT	CO
1	1.1	Define Database.	01	1	1
	1.2	_____ module of the $DBMS$ controls access to $DBMS$ information that is stored on disk.	01	1	1
	1.3	Find the closure of BC for given relation $R(A,B,C,D,E)$ has the following functional dependencies $P \to Q$, $Q \to R$, $QR \to P$, $P \to S$, $T \to P$, $S \to T$.	02	3	3
	1.4	If $X \to YZ$ then $X \to Y$ and $X \to Z$ is _____ rule.	01	2	2
	1.5	Define Views.	02	1	1
	1.6	Find Key of R for the relation scheme $R = \{E,F,G,H,I,J,K,L,M,M\}$ and the set of functional dependencies $\{\{E,F\} \to \{G\},\{F\} \to \{I,J\},\{E,H\} \to \{K,L\}, K \to \{M\}, L \to \{N\}$ on R.	02	3	3
	1.7	What are System Logs?	02	2	1
	1.8	Define Null attribute. Mention any two scenarios where, attribute can have null values.	02	2	2
	1.9	Mention types of $JOIN$ operations in relational algebra.	02	2	3
	1.10	What is join selectivity?	02	2	3
	1.11	What is prime attribute? Give Example.	02	2	3
	1.12	Data in a database at a particular moment in time is called as _____.	01	2	4

PART-B

2	a	Define Database Management Systems. Explain $3-schema$ architecture for $DBMS$ with a neat diagram.	08	2	1
	b	Identify actors on the scene for $HOSPITAL$ Data Management system with example and discuss them each.	08	3	2
3	a	Draw an $ER-diagram$ for a $BANK$ database system. Assume your own entities and identify the following: i) Minimum of 5 entities ii) Attributes for each entity iii) Identifying relationship iv) Weak Entity v) Cardinality ratio and participation constraints.	08	3	3

b	Consider the relational database of the following schema.
	    $LIVES(p\_name, street, city)$ $WORKS(p\_name, c\_name, salary)$
	    $LOCATION(c\_name, city)$ $MANAGES(p\_name, mgr\_name)$
	Give an expression in the relational algebra for each query:
	    i) Retrieve all person names who live in $BANGALORE$.
	    ii) Retrieve the name and salary of all the persons who work for the company $'HP'$.
	    iii) List the names of the persons working for HP along with the cities they live in.
	    iv) Find the names of the persons who live and work in the same city.
	    v) Retrieve the city of $INFOSYS$ company.
	    vi) Display all the employees who live in "Bangalore" and works for "$INFOSYS$".
		08	3	3

OR

4 a	Illustrate the steps involved in $ER - to - Relational$ Mapping.	08	3	2
b	Solve the following operations by considering the tables given below:			

	X				Y		
P	**Q**	**R**	**S**		**R**	**S**	**T**
1	2	3	4		1	2	4
2	2	5	1		3	4	1
3	4	2	6		5	1	6
4	2	5	3		4	2	3

	i) $X * Y$
	    ii) $X \bowtie_{X.S=Y.S} Y$
	    iii) $X \bowtie_{X.P=Y.T} Y$
	    iv) $X \bowtie_{X.S=Y.S} Y$
		08	3	3

5 a	Consider the following relational schema *BOOK*			

ISBN	Book_Title	Category	Price	Copyright_date	Year	Page_count	P_

PUBLISHER

P_ID	Pname	Address	State	Phone	Email − ID

AUTHOR

A_ID	Aname	City	State	Zip	Phone	URL

AUTHOR BOOK

A_ID	ISBN

REVIEW

R_ID	ISBN	Rating

	Solve the following queries using SQL:
	    i) To retrieve Name, City and URL of the author whose name is $'Rama\ karan'$
	    ii) To retrieve title & price of all the textbooks with page count greater than 500
	    iii) To retrieve the details of all the authors whose name ends with the characters in
	    iv) TO retrieve the book categories for which number of books published is less than 5
	    v) TO retrieve the details of books belonging to category with page count greater than 300
		08	3	2

b	Explain the $2NF$ and $3NF$ with examples.	08	2	2

6	a	Let $R = ABCDE$, $R1 = AD$, $R2 = AB$, $R3 = BE$, $R4 = CDE$, and $R5 = AE$. Let the functional dependencies be: $A \rightarrow C$, $B \rightarrow C$, $C \rightarrow D$, $DE \rightarrow C$, $CE \rightarrow A$. Verify whether the given decomposition of R into $\{R1, R2, R3, R4, and\ R5\}$ is lossless join decomposition or not.	06	4	4
	b	Explain aggregate operations in SQL with examples.	06	2	3
	c	Let R be the relation given by R ($Person\_id$, $Name$, $Address$, $Mobile\_num$, $Hobby$). Assume that the following functional dependencies and multivalued dependencies hold on R. $Person\_id \rightarrow address, Name$; $Person\_id \twoheadrightarrow Mobile\_Num$; $Person\_id \twoheadrightarrow Hobby$. Decompose Relation R into $4\,NF$.	04	4	3
7	a	Justify with reasons that, the given schedules are recoverable and conflict serializeable or not. $S1 = r1(A), w2(A), r1(B), c1, w3(B), r3(B), w3(A), c3, r2(C), c2$ $S2 = r1(A), w2(B), r1(B), c1, c2$ $S3 = r1(A), w1(A), r2(A), r1(B), w2(A), c2, a1$ $S4 = r1(A), w1(A), r2(A), r1(B), w2(A), c2, a1$	08	5	4
	b	Illustrate the following with respect to execution of transactions with examples: i) Rules for Binary locking scheme ii) Share and Exclusive locks	08	2	4
8	a	Explain Peer-to-peer Replication with a neat diagram.	08	2	4
	b	Illustrate different phases of $ARIES$ algorithm.	08	2	4