USN | 1 | R | V | 2 | 2 | A | L | 0 | 0 | 7 |

RV COLLEGE OF ENGINEERING®

(An Autonomous Institution Affiliated to VTU)

V Semester B. E. Regular Examinations Feb / March – 2025

Common to CS / CD / CY/AIML

DATABASE MANAGEMENT SYSTEMS

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 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, 9 and 10.

PART-A

			M	BT	CO
1	1.1	The data in a database at a particular moment in time is called _____.	01	1	1
	1.2	Degree of relation is defined as: _____.	01	1	2
	1.3	A relation schema has more than one key, each one of it is called _____.	01	1	1
	1.4	Consider the set of Function Dependency $F = \{A \rightarrow BC, CD \rightarrow EF, C \rightarrow E\}$. Show that $AD \rightarrow F$ and holds in F.	01	2	3
	1.5	Write the difference between a relation and a relation schema.	02	2	2
	1.6	Distinguish between stored and derived attributes. Give an example.	02	2	3
	1.7	Consider a schema $R(A,B,C,D)$ and functional dependencies $A \rightarrow B$ and $C \rightarrow D$. Determine whether the decomposition of R into $R_1(A,B)$ and $R_2(C,D)$ has the dependency preservation property and lossless join property.	02	3	2
	1.8	Given the following relation instance of Relation $R(W,X,Y,Z)$: W X Y 1 1 4 2 2 1 5 3 3 1 6 3 4 1 6 4 Which of the following functional dependencies are satisfied by the instance? a) $WX \rightarrow Y$ b) $Y \rightarrow Z$ c) $XZ \rightarrow W$ d) $Z \rightarrow X$	02	3	3
	1.9	Differentiate between shared and exclusive locks.	02	2	3
	1.10	Does Elastic Search have a schema? Give reason.	02	2	4
	1.11	Give an example for serial schedule and non-serial schedule.	02	2	4
	1.12	List out the desirable properties of transactions.	02	1	2

PART-B

2	a	Discuss the characteristics of the database approach.	06	1	1
	b	Explain with example structural constraints of a relationship type.	06	2	2
	c	Differentiate between physical data independence and logical data independence. Give an example.	04	2	3

3	a	Suppose you are given the following requirements for a simple database for the National Hockey League (*NHL*). The *NHL* has many teams, each team has a name, a city, a coach, a captain, and a set of players. Each player belongs to only one team and each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records. A team captain is also a player, a game is played between two team (referred to as host_team and guest_team) and has a date (such as May 11th 1999) and a score (such as 4 to 2). Construct a clean and concise *ER* diagram for the *NHL* database. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your ER diagram.	08	3	2
	b	Explain how relational model constraints may be violated by insert, delete operations and describe the types of actions that may be taken if these operations cause a violation.	08	2	1
		OR			
4	a	Explain *DIVISION* operation of relational algebra with an example.	06	2	3
	b	For the following schema write the queries in relational algebra. $STUDENT(\underline{SNO}, SNAME, DEPT)$ $COURSE(\underline{CNO}, CNAME, DEPT)$ $ENROLL(\underline{CNO}, \underline{SNO}, GRADE)$ $PREREQ(\underline{CNO, PNO})$ i) Find names of all the students enrolled in course name $(CNAME) = CSE562$ ii) Find names of all the students who took all the courses offered by CSE department. iii) For every course, list the course together with the average grade in that course. iv) List all the students who never got a grade above 3.0 v) Find names of all the courses in which more than 10 students have enrolled.	10	3	5
5	a	Consider the relation scheme $R = (A, B, C, D, E, F, G, H, I, J, K, L)$ with the set of functional dependencies $F = \{\{A, B\} \rightarrow \{C\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\}, \{B\} \rightarrow \{K, L\}\}$ and keys $\{ABD\}, \{K\}$. Find the *FD's* which does not satisfy *2NF* test. Decompose R into 2NF relations.	06	3	3
	b	For the following schema write the *SQL* query: $Supplier(sid: int, sname: string, city: string)$ $Parts(pid: int, pname: string, color: string)$ $Catalog(sid: int, pid: int, cost: real)$ i) Find pid for parts supplied by supplier name 'Ramesh'. ii) Find the number of suppliers who supply red part. iii) Find the number of parts supplied by each supplier.	06	3	2
	c	Explain insert, delete anomalies with examples.	04	2	2
		OR			
6	a	With an example for each, explain second and third normal form based on primary keys.	06	2	2
	b	Consider the following decompositions for the relation schema R. The Relation $R = (A, B, C, D, E, F, G, H, I, J)$ with the set of functional dependencies $F = \{\{AB\} \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\}\}$. Determine whether the following decomposition D lossless join property, with respect to F. $D = \{R_1, R_2, R_3, R_4, R_5\}; R_1 = \{A, B, C\}, R_2 = \{A, D, E\}, R_3 = \{B, F\}, R_4 = \{F, G, H\}, R_5 = \{D, I, J\}$	06	3	3

	c	How *SQL* implements referential integrity constraint of the relational data model? Explain with an example.	04	1	5
7	a	Explain the transaction states with the state diagram.	04	1	2
	b	Consider the three transactions T_1, T_2 and T_3 and Schedules S_1. Draw the serializability graph for S_1 and state schedule is serializable or not. $T_1: r_1(X); r_1(Z); w_1(X);$ $T_2: r_2(Z); r_2(Y); w_2(Z); w_2(Y);$ $T_3: r_3(X); r_3(Y); w_3(Y);$ $S_1: r_1(X); r_2(Z); r_1(Z); r_3(X); r_3(Y); w_1(X); w_3(Y); r_2(Y); w_2(Z); w_2(Y);$	06	3	3
	c	Explain with an example two phase locking protocol.	06	2	4
		OR			
8	a	Why Concurrency control in needed? Explain with an example.	08	2	3
	b	Define Serializability, Conflict Serializability. With an example explain the algorithm for Testing Conflict Serializability of a Schedule.	08	2	2
9	a	Discuss Tokenizer and index in Elastic Search?	06	2	2
	b	Explain Hadoop Distributed File System (*HDFS*) architecture with a neat sketch.	06	1	3
	c	List out the key features of MangoDB NoSQL database.	04	1	1
		OR			
10	a	Discuss MapReduce programming model.	08	2	3
	b	Explain the following types of data with an example: i) Structured ii) Semi structured iii) Unstructured	08	1	4