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# RV COLLEGE OF ENGINEERING®

**(An Autonomous Institution affiliated to VTU)**

**V Semester B. E. Examinations March / April-2023**

## Common to CS / IS

# 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 | _____ is a collection of programs that enables users to create and maintain a database. | 01 |
| | 1.2 | Give an example for Entity type. | 01 |
| | 1.3 | Differentiate between $SELECT$ operation and $PROJECT$ operation. | 02 |
| | 1.4 | Mention the different languages present in $DBMS$. | 02 |
| | 1.5 | 'AS' clause is used in $SQL$ for _____ operation. | 01 |
| | 1.6 | The statement in $SQL$ which allows changing the definition of a table is _____. | 01 |
| | 1.7 | Mention the function of $EXISTS$ in $SQL$. | 01 |
| | 1.8 | _____ is a constraint between 2 sets of attributes from the database relation. | 01 |
| | 1.9 | State Boyce-Codd Normal Form ($BCNF$). | 01 |
| | 1.10 | When do you say schedule is said to be cascadeless? | 01 |
| | 1.11 | Define Fourth Normal Form ($4NF$). | 02 |
| | 1.12 | A binary lock can have _____ and _____ states. | 02 |
| | 1.13 | List the two conditions that decides that given $MVD\ X \rightarrow Y$ is a trival $MVD$. | 02 |
| | 1.14 | Elastic search uses _____ as the serialization format for documents. | 01 |
| | 1.15 | _____ is specified using a $JSON$ request body. | 01 |

**PART-B**

| | | | |
|---|---|---|---|
| 2 | a | Mention the important characteristics of the database approach versus the file processing approach. Explain any two with suitable examples. | 08 |
| | b | Sketch with a neat diagram, the database system environment by clearly mentioning the $DBMS$ component modules. Explain in brief. | 08 |
| | | | |
| 3 | a | List and explain the various characteristics of the relations used in Relational Data model. | 07 |
| | b | Consider the following $ER$ diagram for the manufacturing environments used for tracking of production. It shows relationship between production IoTs, individual production units and raw materials. | |

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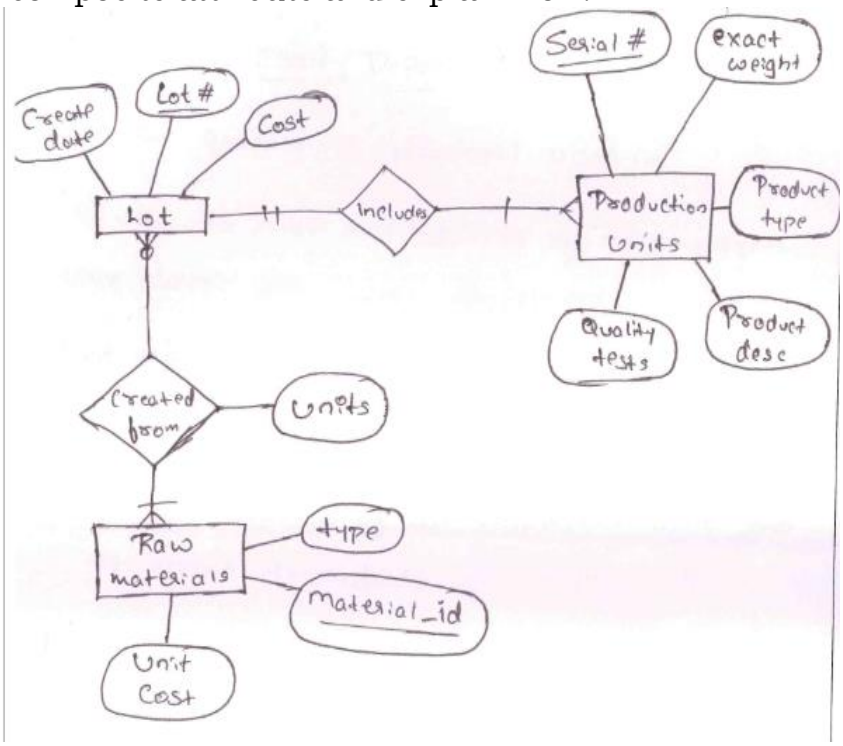
|---|---|---|---|
| | | i) Convert the *ER* diagram into a relational database schema. Indicate primary keys and referential integrity.<br>ii) Identify an attribute in the *ER* diagram that represents a composite attribute and explain how.<br>  <br> | 09 |
| | | **OR** | |
| 4 | a | Summarize the different *JOIN* operations used in the relational algebra with appropriate examples for each. | 06 |
| | b | Consider the following schema for a *COMPANY* database<br>$EMPLOYEE\ (Fname, Lname, SSN, Address, SuperSSN, Sal, DNo)$<br>$DEPARTMENT(Dname, Dnumber, Mgr\_SSN)$<br>$Dept\_LOCATIONS(Dnumber, Dlocation)$<br>$PROJECT(Pname, Pnumber, Plocation, Dnum)$<br>$Works\_on(ESSN, Pno, hours)$<br>$DEPENDENT(ESSN, Dependent\_name, Sex, bdate, relation)$<br>Write the queries in relational algebra.<br>i) Retrieve the name and address of all employees who work for 'Sales' department.<br>ii) Find the names of employees who work on all the projects controlled by the department no. 3.<br>iii) List the names of all employees with two or more departments.<br>iv) Retrieve the names of employees who have no dependents. | 10 |
| | | | |
| 5 | a | Compare and contrast between Nested queries and correlated nested queries. Give relevant examples. | 08 |
| | b | Consider the database schema of Q.4(b), write the *SQL* query for the following:<br>i) List the names of managers who have at least one dependent.<br>ii) Retrieve the list of employees and the projects they are working on, ordered by department and, within each department, ordered alphabetically by last name, first name. | |

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|---|---|---|---|
| | | iii) For each project, retrieve the project number, the project name, and the number of employees who work on that project.<br>iv) For each project on which more than 2 employees work, retrieve the project number, the project name and the number of employees who work on the project. | 08 |
| | | **OR** | |
| 6 | a | With the help of appropriate example describe the second normal form and third normal form. | 08 |
| | b | Give the formal definition of multivalued dependency. List and explain in brief the various inference rules for functional and multivalued dependencies. | 08 |
| | | | |
| 7 | a | Draw a state diagram and discuss the typical states that a transaction goes through during execution. | 09 |
| | b | Define Time stamp in concurrency control. Write and explain the time stamp ordering algorithm. | 07 |
| | | | |
| 8 | a | State and explain the *ARIES* recovery algorithm with an example. | 09 |
| | b | Explain in brief master – slave replication of distribution model with a neat diagram. | 07 |