DBMS Unit 4- QB - abcdefghijklmnopqrstuvwxyz

Database Management Systems (SRM Institute of Science and Technology)

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
Ramapuram Campus, Bharathi Salai, Ramapuram, Chennai - 600089

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OFCOMPUTER SCIENCE AND ENGINEERING

UNIT-IV QUESTIONBANK

Degree & Branch	**: B.TECH- CSE**
Semester	**: III/VI**
Sub Code & Subject Name	: 18CSC303J**-** Database Management Systems
Regulation	**: 2018**
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UNIT-4
QUESTION BANK

Subject Code/Subject Name: 18CSC303J**-** Database Management Systems

SEM/YEAR: VI/III

Course Outcome:

CO5: Apply the knowledge to improve database design using various normalization criteria and optimize queries

Relational Algebra – Fundamental Operators and syntax, relational algebra queries, Tuple relational calculus, Pitfalls in Relational database, Decomposing bad schema Functional Dependency – definition, trivial and non-trivial FD, closure of FD set , closure of attributes irreducible set of FD, Normalization – 1NF, 2NF, 3NF, Decomposition using FD- dependency Preservation, BCNF, Multi- valued dependency, 4NF, Join dependency and 5NF

Q.No.	Questions	Course Outcome	Competence BT Level
1	**A __________expression forms a new relation after applying a number of algebraic operators to an existing set of relations** A. relational expression B. **relational algebra** C. relational calculus D. relational query	CO5	BT1
2	**__________ is used to change the values of some attributes in existing tuples.** A. **Update** B. Drop C. Truncate D. Select	CO5	BT1

3	**Which can be violated if a key value in the new tuple t already exists in another tuple in the relation r(R).** A. Domain constraints B. **Key constraints** C. Integrity constraints D. Rule constraints	CO5	BT1
4	**The relational algebra is a ___________ Query language.** A. Structured B. Logical C. **Procedural** D. Relational	CO5	BT1
5	**The relational calculus is considered to be ____________________.** A. **a nonprocedural language** B. a procedural language C. a structured language D. a unstructured language	CO5	BT1
6	**Which of the following can be violated by delete operation.** A. primary key B. **referential integrity** C. alternate key D. super key	CO5	BT1
7	**Relationship can be created between** A. two tables only B. one table only C. **two or more tables** D. none of the above	CO5	BT1
8	**The value of the atom which evaluates either condition is TRUE or FALSE for particular combination of tuples is classified as** A. Intersection Value B. Union Value C. Deny Value D. **Truth Value**	CO5	BT1

9	**_____________can be violated if the value of any foreign key in t refers to a tuple that does not exist in the referenced relation.** A. Super Key B. **Referential integrity** C. Primary Key D. Candidate Key	CO5	BT1
10	**The relational calculus is important for two reasons. Which of the following is true?** A. **It has a firm basis in mathematical logic and the SQL for RDBMSs has some of its foundations in the tuple relational calculus.** B. It is in relational algebra and the values of some attributes are in existing tuples. C. It is a tuple relational calculus expression and It satisfy Functional dependency. D. None of the above	CO5	BT1
11	**A functional dependency X → Y is _____________if removal of any attribute A from X means that the dependency does not hold any more.** A. a partial functional dependency B. a multivalued functional dependency C. **a full functional dependency** D. a transitive dependency	CO5	BT2
12	**____________ can be violated if an attribute value is given that does not appear in the corresponding domain.** A. **Domain constraints** B. Referential integrity constraints C. Key constraints D. Check constraints	CO5	BT1
13	**A tuple relational calculus expression may generate a/an** A. Finite Relation B. **Infinite Relation** C. Invalid Relation D. Composite Relation	CO5	BT1

14	**Which of the following statements about normal forms is FALSE?** A. BCNF is stricter than 3NF B. Lossless,dependency-preserving decomposition into 3NF is always possible. C. **Lossless,dependemcy-preserving decomposition into BNF is always possible.** D. Any relation with two attributes is in BCNF.	CO5	BT1
15	**Third normal form is based on the concept of__________.** A. **transitive dependency** B. partial dependency C. multivalued dependency D. full functional dependency	CO5	BT1
16	**The only attribute values permitted by 1NF are ___________values.** A. Divisible B. **Single atomic** C. Multiple D. Numeric	CO5	BT1
17	**A relational query language L is considered relationally complete if we can express in L any query that can be expressed in__________.** A. Relational Algebra B. Structured Language C. **Relational calculus** D. Logical Language	CO5	BT1
18	**Anomalies are avoided by splitting the offending relation into multiple relations,is also known as_______.** A. Accupressure B. **Decomposition** C. Precomposition D. Both decomposition & precomposition E.	CO5	BT1

19	**Consider the relation(ABCDEF)** **FDs:** **A FC** **C D** **B E** **Find the 3NF relations:** A. ACDF,BE,AB B. ACDF,BE,AB,CD C. **CD,ACF,BE,AB** D. ACF,CDF,AB,BE	CO5	BT3
20	**The tuple relational calculus is based on specifying a number of __________.** A. String Variables B. Column Variables. C. Relation Variables D. **Tuple Variables.**	CO5	BT1
21	**Consider the relation (ABCDEF)** **A FC** **C D** **B E** **Find the 2NF relations** A. ACDF,AE B. **ACDF,BE,AB** C. BE,AB D. ACD,BE,AB	CO5	BT3
22	**The relation X(ABCDEF) with functional dependency set F={AB CD,C CA,B E,D B,E F}. The number of candidate keys of a relation R is ______.** A. 3 B. **4** C. 2 D. 5	CO5	BT3
23	**First normal form disallows ____________.** A. indivisible values B. divisible values C. single atomic values D. **multivalued attributes**	CO5	BT1

24	**In a functional dependency X --> Y, if Y is functionally dependent on X, but not on X's proper subsets, then we would call the functional dependency as** A. **Full Functional Dependency** B. Partial Functional Dependency C. Multivalued Functional Dependency D. None of the above	CO5	BT2
25	**A functional dependency X → Y is a ____________if some attribute A ε X can be removed from X and the dependency still holds.** A. **Partial Dependency** B. Multivalued Dependency C. Transitive Dependency D. Full Functional Dependency.	CO5	BT2
26	**An Multi Valued Dependency X →→ Y in R is called a __________ if (a) Y is a subset of X, or (b) X ∪ Y = R.** A. Total Multi Valued Dependency B. **Trivial Multi Valued Dependency** C. Non-trivial Multi Valued Dependency D. Partial Multi Valued Dependency	CO5	BT2
27	**Consider a Relation R(ABCDE) with Functional Dependency** **A BCDE,BC ADE,D E** **The Decomposition of R in 3NF will be** A. R1(ABCE) and R2(DE) B. R1(ADE) and R2(BC) C. R1(ABDE) and R2(BDE) D. **R1(ABCD) and R2(DE)**	CO5	BT3
28	**A large number of commercial applications running against relational databases is called as ________________________** A. Data Control Language B. Structured Query Language C. **Online Transaction Processing** D. MongoDataBase	CO5	BT1
29	**A simple tuple relational calculus query is of the form:** A. {p | COND(t)} B. **{t | COND(t)}** C. {p | COND(p)} D. {p| P(t)}	CO5	BT1

30	**Which of the following is the result of bad database design?** A. Repetition of Information B. Inability to represent some information C. Inconsistent database state due to some transaction D. **All of the above**	CO5	BT1
31	**Third normal form (3NF) is based on the concept of _______________.** A. Partial Dependency B. Multivalued Dependency C. **Transitive Dependency** D. Join Dependency	CO5	BT1
32	**Second normal form (2NF) is based on the concept of** A. Partial Dependency B. Multivalued Dependency C. Transitive Dependency D. **Full Functional Dependency.**	CO5	BT1
33	**An attribute is called _________,if it is not a member of any candidate key.** A. Prime B. **Non-prime** C. Composite D. Derived	CO5	BT1
34	**Consider F1 and F2 as two sets of functional dependencies. If every functional dependency in F2 can be inferred from the functional dependencies of F1 using inference rules, then F1 is _________ of F2.** A. **Cover Set** B. Closure Set C. Minimal Set D. None of the above	CO5	BT2
35	**Two special symbols called quantifiers can appear in formulas; they are :** A. universal quantifier ($\forall$) and the existential quantifier ($\exists$). B. universal quantifier (A) and the existential quantifier (E). C. conditional quantifier ($\forall_A$) and the generalized quantifier ($\exists_A$). D. None of the above.	CO5	BT2

36	**_______________denoted by JD(R1, R2, ..., Rn), specified on relation schema R, specifies a constraint on the states r of R.** A. Partial Dependency B. **Join Dependency** C. Join Decomposition D. Join Database	CO5	BT2
37	**The normalization process, as first proposed by** A. Edgar F. Codd B. Peter Landin C. Mark Edward D. Sandford	CO5	BT1
38	**Assume a relation R(A, B, C, D) with set of functional dependencies F={C→D,C→A,B→C}. Use this setup to answer the following questions; Which of the following is the candidate keys of R?** A. C B. BC C. **B** D. Both (b) and (c)	CO5	BT3
39	**An attribute of relation schema R is called ___________of R if it is a member of some candidate key of R.** A. a non-prime attribute B. **a prime attribute** C. Composite attribute D. Derived attribute	CO5	BT2
40	**Consider the relation schema R={E,F,G,H,I,J,K,L,M,N} and the set of functional dependencies EF G,F IJ,EH KL,K M,L N ON r. What is the key for R?** A. {E,F} B. **{E,F,H}** C. {E,F,H,K,L} D. {E}	CO5	BT3
41	**If X --> Y is a functional dependency and X and Y are sets of attributes, what is the relationship between X and Y?** A. One-to-Many B. Many-to-One C. **One-to-One** D. Many-to-Many	CO5	BT1

42	**A ________of a relation schema R = {A1, A2, ... , An} is a set of attributes S ⊆ R with the property that no two tuples t_1 and t_2 in any legal relation state r of R will have $t_1[S] = t_2[S]$.** A. **super key** B. foreign key C. candidate key D. alternate key	CO5	BT1
43	**For a functional dependency X --> Y, it is said to be _________ if Y is the subset or equal to X.** E. Total functional dependency F. **Trivial functional dependency** G. Non-trivial functional dependency H. Partial functional dependency	CO5	BT1
44	**A functional dependency set F={A B,BC E,ED A,EF G,E F} Find out the closure of (AC)** A. {A,B,C,D,E,F,G} B. {A,B,D,E,F} C. {A,B,C,E} D. **{A,B,C,E,F,G}**	CO5	BT3
45	**Let R(A,B,C,D) be a relation schema and F{A BC,AB D,B C} Be the set of functional dependencies define over R. Which of the following represents the closure of the attribute set{B}?** A. {A,C,D} B. **{B,C}** C. {A,B,C} D. {B}	CO5	BT3
46	**A table is in 2NF if it is in 1NF and if:** A. no column that is not a part of the primary key is dependent on only a portion of the alternate key. B. **no column that is not a part of the primary key is dependent on only a portion of the primary key.** C. no column that is not a part of the primary key is dependent on only a portion of the foreign key. D. none of these	CO5	BT2

47	**_______________is the process of storing the join of higher normal form relations as a base relation, which is in a lower normal form.** A. **Denormalization** B. Normalization C. Dependency D. Relational Algebra	CO5	BT1
48	**R(A,B,C,D) is a relation,which of the following does not have a lossless join dependency preserving BCNF decomposition.** A. **A B,B CD** B. A B,B C,C D C. AB C,C AD D. A BCD	CO5	BT3
49	**Which normal form is considered adequate for relational database design?** A. 2NF B. **3NF** C. 4 NF D. BCNF	CO5	BT1
50	**A functional dependency of the form x —> y is trival if ___________.** A. **$y \subseteq x$** B. $y \subset x$ C. $x \subset y$ D. $x \subset y$ and $y \subset x$	CO5	BT2
PART B (4 Marks)			

1	**Explain select and project operation in relational algebra.** **Ans:** **Select operation** It displays the records that satisfy a condition. It is denoted by sigma (σ) and is a horizontal subset of the original relation. **Syntax:** **$\sigma_{condition}$(table name)** **Projection operation** It displays the specific column of a table. It is denoted by pie (∏). It is a vertical subset of the original relation. It eliminates duplicate tuples. **Syntax:** **$\prod_{condition}$(table name)**	CO5	BT1
2	**Consider the following schema:** **Suppliers(sid: integer, sname: string, address: string)** **Parts(pid: integer, pname: string, color: string)** **Catalog(sid: integer, pid: integer, cost: real)** **The key fields are underlined, and the domain of each field is listed after the field name. Thus sid is the key for Suppliers, pid is the key for Parts,and sid and pid together form the key for Catalog. The Catalog relation lists the prices charged for parts by Suppliers. Write the following queries in relational algebra.** **a) Find the names of suppliers who supply some red part** **b) Find the sids of suppliers who supply some red or green part.** **c) Find the sids of suppliers who supply some red part or are at 221 Packer Ave** **d) Find the sids of suppliers who supply some red part and some green** **part** **Ans:** $\pi_{sname}(\pi_{sid}((\pi_{pid}\sigma_{color=\text{"red"}}Parts) \bowtie Catalog) \bowtie Suppliers)$ $\pi_{sid}((\pi_{pid}\sigma_{color=\text{"red"} \vee color=\text{"green"}}Parts) \bowtie Catalog)$ $\pi_{sid}((\pi_{pid}\sigma_{color=\text{"red"}}Parts) \bowtie Catalog) \cup \pi_{sid}(\sigma_{address=\text{"221 Parker Ave."}}Supplier)$ $\pi_{sid}((\pi_{pid}\sigma_{color=\text{"red"}}Parts \cap (\pi_{pid}\sigma_{color=\text{"green"}}Parts)) \bowtie Catalog)$	CO5	BT2

3	**What are the Pitfalls in Relational database design?** **Ans:** Relational database design requires that we find a “good” collection of relational schemas. A bad design may lead to ● Repetition of information ● Inability to represent certain information Design Goals for Relational Database: 1. Avoid redundant data 2. Ensure that relationships among attributes are represented. 3. Facilitate the checking of updates for violation of database integrity constraints Example: Consider the relational schema Lending-schema = (branch-name, branch-city, assets, customer-name, loan- number, amount) Redundancy: ● Data for branch name, branch city, assets are repeated for each loan that a branch makes. ● Wastes space and complicates updating. Null Values: ● cannot store information about a branch if no loan exists. ● can use null values, but they are difficult to handle. In the given example the database design is faulty which makes the above pitfalls in database. So, in relational database design if the design is not good then there will be faults in databases.	CO5	BT1
4	**Write short note on normalization.** **Ans:** Database Normalization is a design technique. Using this we can design or re-design schemas in the database to reduce redundant data and the dependency of data by breaking the data into smaller and more relevant tables. The primary purpose of the normalization is to reduce the data redundancy i.e. the data should only be stored once. This is to avoid any data anomalies that could arise when we attempt to store the same data in two different tables, but changes are applied only to one and not to the other.	CO5	BT1

5

Explain 1NF with suitable example.
Ans:

First Normal Form (1NF):

- A relation will be 1NF if it contains an atomic value.
- It states that an attribute of a table cannot hold multiple values. It must hold only single-valued attribute.
- First normal form disallows the multi-valued attribute, composite attribute, and their combinations.

Example:
Relation STUDENT in table 1 is not in 1NF because of multi-valued attribute STUD_PHONE. Its decomposition into 1NF has been shown in table 2.

STUD_NO	STUD_NAME	STUD_PHONE	STUD_STATE	STUD_COUNTRY
1	RAM	9716271721, 9871717178	HARYANA	INDIA
2	RAM	9898297281	PUNJAB	INDIA
3	SURESH		PUNJAB	INDIA

Table 1

Conversion to first normal form

STUD_NO	STUD_NAME	STUD_PHONE	STUD_STATE	STUD_COUNTRY
1	RAM	9716271721	HARYANA	
1	RAM	9871717178	HARYANA	INDIA
2	RAM	9898297281	PUNJAB	INDIA
3	SURESH		PUNJAB	INDIA

CO5

BT1

6

Explain Insert Anomalies with example.
Ans:
Insertion anomaly:
If a tuple is inserted in referencing relation and referencing attribute value is not present in referenced attribute, it will not allow inserting in referencing relation. For Example, If we try to insert a record in STUDENT_COURSE with STUD_NO =7, it will not allow.

STUDENT

STUD_NO	STUD_NAME	STUD_PHONE	STUD_STATE	STUD_COUNTRY	STUD_AGE
1	RAM	9716271721	Haryana	India	20
2	RAM	9898291281	Punjab	India	19
3	SUJIT	7898291981	Rajsthan	India	18
4	SURESH		Punjab	India	21

Table 1

STUDENT_COURSE

STUD_NO	COURSE_NO	COURSE_NAME
1	C1	DBMS
2	C2	Computer Networks
1	C2	Computer Networks

Table 2

CO5

BT2

<table>
<tr>
<td>7</td>
<td>
Illustrate functional dependency with example?
Ans:
Functional Dependency (FD) is a constraint that determines the relation of one attribute to another attribute in a Database Management System (DBMS). Functional Dependency helps to maintain the quality of data in the database.
A functional dependency is denoted by an arrow “→”. The functional dependency of X on Y is represented by X → Y.
Example:
<table>
<tr><th>Employee number</th><th>Employee Name</th><th>Salary</th><th>City</th></tr>
<tr><td>1</td><td>Dana</td><td>50000</td><td>San Francisco</td></tr>
<tr><td>2</td><td>Francis</td><td>38000</td><td>London</td></tr>
<tr><td>3</td><td>Andrew</td><td>25000</td><td>Tokyo</td></tr>
</table>
In this example, if we know the value of Employee number, we can obtain Employee Name, city, salary, etc. By this, we can say that the city, Employee Name, and salary are functionally depended on Employee number.
</td>
<td>CO5</td>
<td>BT2</td>
</tr>
</table>

<table>
<tr>
<td>8</td>
<td>
Demonstrate transitive dependency? Give an example?
Ans:
A functional dependency is said to be transitive if it is indirectly formed by two functional dependencies. For Eg: X -> Z is a transitive dependency if the following three functional dependencies hold true:
X->Y
Y does not ->X
Y->Z
Example:
<table>
<tr><th>Book</th><th>Author</th><th>Author_age</th></tr>
<tr><td>Game of Thrones</td><td>George R. R. Martin</td><td>66</td></tr>
<tr><td>Harry Potter</td><td>J. K. Rowling</td><td>49</td></tr>
<tr><td>Dying of the Light</td><td>George R. R. Martin</td><td>66</td></tr>
</table>

{Book} ->{Author} (if we know the book, we knows the author name)

{Author} does not ->{Book}

{Author} -> {Author_age}

Therefore as per the rule of transitive dependency: {Book} -> {Author_age} should hold, that makes sense because if we know the book name we can know the author’s age.
</td>
<td>CO5</td>
<td>BT2</td>
</tr>
</table>

9	**Define Armstrong axioms for FD's?** **Ans:** 1. Reflexive Rule (IR_1) In the reflexive rule, if Y is a subset of X, then X determines Y. If $X \supseteq Y$ then $X \rightarrow Y$ 2. Augmentation Rule (IR_2) The augmentation is also called as a partial dependency. In augmentation, if X determines Y, then XZ determines YZ for any Z. 3. Transitive Rule (IR_3) In the transitive rule, if X determines Y and Y determine Z, then X must also determine Z. If $X \rightarrow Y$ and $Y \rightarrow Z$ then $X \rightarrow Z$ 4. Union Rule (IR_4) Union rule says, if X determines Y and X determines Z, then X must also determine Y and Z. If $X \rightarrow Y$ and $X \rightarrow Z$ then $X \rightarrow YZ$ 5. Decomposition Rule (IR_5) Decomposition rule is also known as project rule. It is the reverse of union rule. This Rule says, if X determines Y and Z, then X determines Y and X determines Z separately. If $X \rightarrow YZ$ then $X \rightarrow Y$ and $X \rightarrow Z$ 6. Pseudo transitive Rule ($IR_{6)}$ In Pseudo transitive Rule, if X determines Y and YZ determines W, then XZ determines W. 7.Composition (IR_7) If $A \rightarrow B$ and $X \rightarrow Y$ then $AX \rightarrow BY$	CO5	BT2
10	**Explain about BCNF?** **Ans:** ● BCNF is the advance version of 3NF. It is stricter than 3NF. ● A table is in BCNF if every functional dependency $X \rightarrow Y$, X is the super key of the table. ● For BCNF, the table should be in 3NF, and for every FD, LHS is super key. ● BCNF decomposition does not always satisfy dependency preserving property. ● After BCNF decomposition if dependency is not preserved then we have to decide whether we want to remain in BCNF or rollback to 3NF. This process of rollback is called denormalization.	CO5	BT2

11	**Let F = {A → B, AB → E, BG → E, CD → I, E → C}. Find the closures, A^+, $(AE)^+$ and $(ADE)^+$.** **Ans:** **<u>To find $A^{\pm}$:</u>** result := A If you know A, then you would know AB from the functional dependency (FD) A → B. result := AB If you know AB, then you would know ABE from the FD AB → E. result := ABE If you know ABE, then you would know ABEC from the FD E → C. result := ABCE We have included all the LHS of given functional dependencies. No FDs of left hand that has ABCE in it. Hence, our algorithm stops at this point. And **the closure is ABCE**. **<u>To find $(AE)^{\pm}$:</u>** result := AE result := ABE from the FD A → B result := ABCE from the FD E → C. We cannot move further. Hence, **the closure is ABCE**. **<u>To find (ADE)+:</u>** result := ADE result := ABDE from the FD A → B result := ABCDE from the FD E → C result := ABCDEI from the FD CD → I We cannot move further. Hence, the closure is ABCDEI. The closures are; **A+ = ABCE** **(AE)+ = ABCE** **(ADE)+ = ABCEDI**	CO5	BT3
12	**What is Denormalization? Give it's advantages and disadvantages.** Denormalization is a database optimization technique where we add redundant data in the database to get rid of the complex join operations. This is done to speed up database access speed. Denormalization is done after normalization for improving the performance of the database. The data from one table is included in another table to reduce the number of joins in the query and hence helps in speeding up the performance. **Advantages of Denormalization:** Query execution is fast since we have to join fewer tables. **Disadvantages of Denormalization:** ● As data redundancy is there, update and insert operations are more expensive and take more time. Since we are not performing normalization, so this will result in redundant data. ● Data Integrity is not maintained in denormalization. As there is redundancy so data can be inconsistent.	CO5	BT2

PART C (12 Marks)			
1	Define Functional Dependencies. Discuss about different functional dependencies	CO5	BT2
2	What are the problems caused by Redundancy? Explain about Normalization and need for normalization.	CO5	BT1
3	Define Normalization. Explain about 1NF, 2NF with relevant examples.	CO5	BT2
4	Explain about 3NF and BCNF with relevant table structure.	CO5	BT2
5	Explain about Multi-valued dependencies and Fifth Normal Form with suitable examples.	CO5	BT2