

**III B. Tech I Semester Regular/Supplementary Examinations, March - 2021**  
**DATA BASE MANAGEMENT SYSTEMS**

(Common to Computer Science and Engineering, Information Technology)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

2. Answer **ALL** the question in **Part-A**

3. Answer any **FOUR** Questions from **Part-B**

**PART -A**

(14 Marks)

1. a) What is the role of a Database Administrator? [2M]
- b) What is meant by identifying relationship in an ER diagram? [2M]
- c) Why correlated sub queries are exhibit slower performance? [2M]
- d) What property of decomposition is guaranteed by both BCNF and 3NF? [3M]
- e) What is a recoverable schedule? [3M]
- f) Will clustered index allow duplicates? Justify your answer. [2M]

**PART -B**

(56 Marks)

2. a) Explain any four significant advantages of using Data Base Management Systems over storing conventional file system for maintaining data in an organization. [7M]
- b) Discuss various categories of users of DBMS system. [7M]
3. a) Give the diagrammatic representation of the recursive relationship and also explain the importance of role names in representing a recursive relationship by taking a real time example. [7M]
- b) With a suitable example, explain the division and set operator of Relational algebra. [7M]
4. a) Consider the following Relational schemas, [7M]  
 Sailors( sid: *Integer*, sname: *String*, age: *Integer*, rating: *Integer*)  
 Boats(bid: *Integer*, bname: *String*, bcolor: *String*)  
 Reserves(sid: *Integer*, bid: *Integer*, date: *Date*)  
 i) Write a query to find the names of sailors with age over 20 years and not reserved a red color boat  
 ii) Write a query to find the age of the youngest sailor for each rating level.
- b) What are triggers in DBMS? How triggers are used to enforce complex integrity constraints in DBMS? [7M]
5. a) Given a Relation R=(A,B,C) and Functional Dependencies are F={ {A,B}→{C}, {C}→{A} }. Determine all Candidate keys of R and the highest normal form of R with proper explanation. [10M]
- b) Explain the Loss less join property of schema decomposition. [4M]
6. a) Discuss the variants of Two-phase locking protocol by taking suitable examples. [10M]
- b) Write the merits and demerits of deferred database modification and immediate database modification techniques. [4M]
7. a) How records are represented and organized in a file? Explain with suitable example. [7M]
- b) Write the significant differences between B-Trees and B+ Trees for creating dynamic indexes in DBMS. [7M]

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**PART -A**

(14 Marks)

1. a) List any six popular Database Management System softwares. [2M]
- b) What do you mean by weak entity set? Give example. [2M]
- c) How null values are treated by aggregate function? [2M]
- d) When schema decomposition is said to be dependency-preserving? [3M]
- e) What is the objective of concurrency control mechanism in DBMS? [3M]
- f) What is hash based indexing in DBMS? [2M]

**PART -B**

(56 Marks)

2. a) Explain in detail about the key components of the DBMS system structure. [7M]
- b) Describe any four significant applications of DBMS in real time environment. [7M]
3. a) Explain the types of integrity constraints in DBMS with a suitable example. [7M]
- b) What are the types of Relational calculus? Explain with sample queries. [7M]
4. a) Consider the following Relational schemas, [7M]  
 Sailors( sid: *Integer*, sname: *String*, age: *Integer*, rating: *Integer*)  
 Boats(bid: *Integer*, bname: *String*, bcolor: *String*)  
 Reserves(sid: *Integer*, bid: *Integer*, date: *Date*)  
 i) Write a query to find the names of sailors who have reserved both red and blue color boats on 01-JAN-2021.  
 ii) Write a query to find the name and age of oldest sailor  
 iii) Write a query to find sailors with high rating reserves 'Red' color boat.
- b) What is a Trigger? And what are its three parts? Explain the differences between Triggers and Integrity constraints. [7M]
5. a) Explain the two properties of schema decomposition with suitable examples. [7M]
- b) State and explain BCNF with an example. [7M]
6. a) Explain the Lost update problem in DBMS with a suitable example. [7M]
- b) Explain the Timestamp based concurrency control mechanism. [7M]
7. a) What is a B+Tree? Describe the properties of B+trees. Explain the structure of internal and external nodes in B+tree. [7M]
- b) How the records are organized in Heap and Sequential files? Explain. [7M]

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**PART -A****(14 Marks)**

1. a) What is the role of Database Designers? [2M]
- b) Can a foreign key value in a database be NULL? Justify your answer. [2M]
- c) Why we need Triggers in a database? [2M]
- d) Define Multi valued dependency. [3M]
- e) Write about wound wait technique for prevention of deadlock. [3M]
- f) Is primary index a dense index or sparse index? Justify your answer. [2M]

**PART -B****(56 Marks)**

2. a) With a neat sketch explain the functioning of client server architecture and elaborate the importance of DBMS in it. [7M]
- b) Discuss various levels of data abstraction in a DBMS. [7M]
3. a) In an Entity-Relationship diagram, can a relationship have attributes associated with it? Give explanation with a suitable example. [7M]
- b) Consider the following Relational Schemas, [7M]  
 Student(rollno, name, degree, year, gender, deptno, advisor)  
 Department(deptid, deptname, hod, phone)  
 Write a query in relational algebra for:  
 i) Obtaining the rollno and name of all girl students in the CSE department.  
 ii) Determine the departments that do not have any girl students.
4. a) Explain the necessity of NULL values in SQL with an example and also explain how these NULL values are treated by aggregate functions? [5M]
- b) Consider the following relational schema: [9M]  
 Trans-Mstr (TID: Integer, ACCNO: Integer, DATE: Date,  
 DR-CR: varchar, AMT: number(8,2), CURBAL: number(8,2))  
 Write a database trigger on the TRANS-MSTR that checks the following:  
 i) The account number for which the transaction is being performed is a valid account number.  
 ii) In case of a withdrawal the amount does not exceed the current balance for that account number.
5. a) What is dependency preservation property for decomposition? Explain why it is important? [7M]
- b) State and explain Third normal form with an example. [7M]

6. a) What are ACID properties? Illustrate them through examples and also explain commit and Rollback. [7M]  
b) Why database management recovery is needed? Explain various data structures that are required for database management recovery by log-based schemes. [7M]
7. a) Construct a B+Tree for the following list of elements: [8M]  
1, 4, 7, 10, 17, 21, 31, 25, 19, 20, 28, 42.  
Assume the initial tree is empty and a node can hold maximum 3 key values.
- b) How to handle bucket overflow in hash based indexing mechanism? Explain. [6M]

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**PART -A****(14 Marks)**

1. a) What is meant by Data independence and why it is important? [2M]
- b) How do you write a query in tuple relational calculus? [2M]
- c) What is the Having clause in SQL query? [2M]
- d) Why decomposition is required in DBMS? [3M]
- e) How the checkpoints are used for the recovery of database? [3M]
- f) Is secondary index a dense index or sparse index? Justify your answer. [2M]

**PART -B****(56 Marks)**

2. a) Discuss the main characteristics of the DBMS and how it differs from traditional file systems? [7M]
- b) Explain the difference between external, internal and conceptual schemas. How are these different schema layers related to the concepts of logical and physical data independence? [7M]
3. a) Explain in detail about the strong entity set and weak entity set in ER diagrams. [7M]
- b) Consider the following Relational schemas, [7M]  
 Sailors(sid: *Integer*, sname: *String*, age: *Integer*, rating: *Integer*)  
 Boats(bid: *Integer*, bname: *String*, bcolor: *String*)  
 Reserves(sid: *Integer*, bid: *Integer*, date: *Date*)  
 i) Write a query to find the names of sailors who have not reserved red color boat.  
 ii) Write a query to find all sids of sailors who are having rating of 10 and reserved boat number 104.
4. a) Illustrate the complex integrity constraints in SQL. [5M]
- b) Given Student Report Database, in which student marks assessment is recorded(Assume 3 subjects). Create a trigger so that the total and average of specified marks is automatically inserted whenever a record is insert. [9M]
5. a) Discuss the problem of Spurious tuples in database. [4M]
- b) Given a Relation R=(A,B,C,D,E) and Functional Dependencies are: [10M]  
 $F = \{ BC \rightarrow D, AC \rightarrow BE, B \rightarrow E \}$   
 Determine all Candidate keys of R and the highest normal form of R with proper explanation.

6. a) Discuss various anomalies that arise due to interleaved execution of transactions with suitable examples for each. [7M]  
b) How does a checkpoint mechanism help in database recovery? Explain through an example. [7M]
7. a) Construct a B-Tree for the following list of elements: [7M]  
1, 4, 7, 10, 17, 21, 31, 25, 19, 20, 28, 42.  
Assume the initial tree is empty and a node can hold maximum 3 key values.
- b) Explain the following: [7M]  
i) Primary index  
ii) Secondary index  
iii) Clustered index.

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