Hall Ticket No | | | | | | | | | | Question Paper Code: ACS553

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER -1

B.Tech VII Semester End Examinations (Regular), November – 2019

Regulations: IARE-R16

FUNDAMENTAL OF DATABASE MANAGEMENT SYSTEMS

(EEE/MECH)

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

Unit – I

1	a)	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]
	b)	What are the responsibilities of a DBA? If we assume that the DBA is never interested in running his or her own queries, does the DBA still need to understand query optimization? Why?	[7M]
2	a)	Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted.	[7M]
	b)	Suppose we create a phone directory of friends with family name, first name and phone number on each line. How shall we use AWK to determine which is the most commonly occurring family name in our phone directory?	[7M]

Unit – II

3	a)	Explain the statement that relational algebra operators can be composed. Why is the ability to compose operators important?	[7M]
	b)	Given two relations R1 and R2, where R1 contains N1 tuples, R2 contains N2 tuples, and N2 > N1 > 0, give the minimum and maximum possible sizes (in tuples) for the resulting relation produced by each of the following relational algebra expressions. In each case, state any assumptions about the schemas for R1 and R2 needed to make the expression meaningful: (1) $R1 \cup R2$, (2) $R1 \cap R2$, (3) $R1 - R2$, (4) $R1 \times R2$, (5) $\sigma a=5(R1)$, (6) $\pi a(R1)$, and (7) $R1/R2$	[7M]
4	a)	What is relational completeness? If a query language is relationally complete, can you write any desired query in that language?	[7M]
	b)	Consider the following database. Employee (employee-name, street, city) Works (employee-name, company-name, salary) Company (company-name, city) Manager (employee-name, manager- name) Give an expression in the relational algebra, the tuple relational calculus, and the domain relational calculus, for the following query. Find the names of all employees who work for estate bank.	[7M]

Unit – III

5 **a)** What is a view? How do views support logical data independence? How are views used for security? How are queries on views evaluated? Why does SQL restrict the class of views that can be updated? **[7M]**

b) Consider the following relations: **[7M]**

Student(snum: integer, sname: string, major: string, level: string, age: integer)

Class(name: string, meets at: string, room: string, fid: integer)

Enrolled(snum: integer, cname: string)

Faculty(fid: integer, fname: string, deptid: integer)

Write the following queries in SQL. No duplicates should be printed in any of the answers.

1. Find the names of all Juniors (level = JR) who are enrolled in a class taught by I. Teach.
2. Find the age of the oldest student who is either a History major or enrolled in a course taught by I. Teach.
3. Find the names of all classes that either meet in room R128 or have five or more students enrolled.
4. Find the names of all students who are enrolled in two classes that meet at the same time.

6 **a)** What is Normalization? What are the different types of normalizations? Discuss the 1NF, 2NF and 3NF with example. **[7M]**

b) Consider the employee database, where the primary keys are Underlined. **[7M]**

employee(empname,street,city) works(empname,companyname,salary)

company(companyname,city) manages(empname,management) Give an expression in the relational algebra for each request.

1. Find the names of all employees who work for First Bank Corporation.
2. Find the names, street addresses and cities of residence of all employees who work for First Bank Corporation and earn more than 200000 per annum
3. Find the names of all employees in this database who live in the same city as the company for which they work.
4. Find the names of all employees who earn more than every employees of small Bank Corpor.

Unit – IV

7 **a)** Explain the distinction between serial schedule and serializable schedule with examples? **[7M]**

b) Suppose that there is a database system that never fails. Analyze whether a recovery manager required for this system. **[7M]**

8 **a)** Describe how a typical lock manager is implemented. Why must lock and unlock be atomic operations? **[7M]**

b) What is the difference between a lock and a latch? What are convoys and how should a lock manager handle them? **[7M]**

Unit – V

9 **a)** What is the phantom problem? Can it occur in a database where the set of database objects is fixed and only the values of objects can be changed? **[7M]**

b) Consider a database with objects X and Y and assume that there are two transactions T1 and T2. Transaction T 1 reads objects X and Y and then writes object X. Transaction T 2 reads objects X and Y and then writes objects X and Y. **[7M]**

1. Give an example schedule with actions of transactions T 1 and T 2 on objects X and Y that results in a write-read conflict.
2. Give an example schedule with actions of transactions T 1 and T 2 on objects X and Y that results in a read-write conflict.

3. Give an example schedule with actions of transactions T 1 and T 2 on objects X and Y that results in a write-write conflict.
4. For each of the three schedules, show that Strict 2PL disallows the schedule.

10	**a)**	With a neat diagram explain NO-UNDO/NO-REDO recovery mechanism in transaction processing	**[7M]**
	b)	Compare the shadow-paging recovery scheme with the log-based recovery schemes in terms of overhead Cost.	**[7M]**

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COURSE OBJECTIVES

The course should enable the students to:

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I	Discuss the basic database concepts, applications, data models, schemas and instances.
II	Design Entity Relationship model for a database.
III	Demonstrate the use of constraints and relational algebra operations.
IV	Describe the basics of SQL and construct queries using SQL.
V	Understand the importance of normalization in databases.

COURSE LEARNING OUTCOMES

Students, who complete the course, will have demonstrated the ability to do the following:

ACS553.01	Define the terminology, features, and characteristics of database system.
ACS553.02	Differentiate database systems from file systems.
ACS553.03	Describe Data Models, Schemas, Instances, Three Schema Architecture and DBMS Component Modules.
ACS553.04	Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram.
ACS553.05	Model the real world database systems using Entity Relationship Diagrams (ERD) from the requirements specification.
ACS553.06	Describe basics of the relational data model.
ACS553.07	Transform an information model into a relational database schema and implement schema using data definition language and/or utilities.
ACS553.08	Formulate solutions to a broad range of query problems using relational algebra.
ACS553.09	Apply relational calculus to solve broad range of query problems.
ACS553.10	Illustrate the Functional Dependencies , Inference Rules, Minimal Sets of FDs.
ACS553.11	Understand normalization theory and improve the design by normalization.
ACS553.12	Understand the properties of transaction (ACID).
ACS553.13	Demonstrate serializability by taking various schedules.
ACS553.14	Gain knowledge on transaction processing to maintain consistency and integrity of data in database systems.
ACS553.15	Describe concurrency control techniques to implement data integrity in database systems.
ACS553.16	Illustrate various backup and recovery techniques for database systems.
ACS553.17	Analyze transaction processing, concurrency control, Database recovery techniques.
ACS553.18	Illustrate various lock based protocols.
ACS553.19	Analyze various time stamp based protocols.
ACS553.20	Understand the concepts of update and shadow paging.

MAPPING OF SEMESTER END EXAM TO COURSE LEARNINIG OUTCOMES

SEE Question No.		Course Learning Outcomes		Outcomes	Blooms Taxonomy Level
1	a	ACS553.01	Define the terminology, features, and characteristics of database system	CO 1	Understand
	b	ACS553.02	Differentiate database systems from file systems.	CO 1	Remember
2	a	ACS553.03	Model the real world database systems using Entity Relationship Diagrams (ERD) from the requirements specification.	CO 1	Remember
	b	ACS553.05	Model the real world database systems using Entity Relationship Diagrams (ERD) from the requirements specification.	CO 1	Remember
3	a	ACS553.05	Formulate solutions to a broad range of query problems using relational algebra.	CO 2	Remember
	b	ACS553.07	Formulate solutions to a broad range of query problems using relational algebra.	CO 2	Understand
4	a	ACS553.08	Apply relational calculus to solve broad range of query problems	CO 2	Remember
	b	ACS553.08	Apply relational calculus to solve broad range of query problems	CO 2	Remember
5	a	ACS553.09	Transform an information model into a relational database schema and implement schema using data definition language and/or utilities.	CO 3	Remember
	b	ACS553.10	Illustrate the Functional Dependencies , Inference Rules, Minimal Sets of FDs.	CO 3	Remember
6	a	ACS553.10	Illustrate the Functional Dependencies , Inference Rules, Minimal Sets of FDs.	CO 3	Remember
	b	ACS553.11	Transform an information model into a relational database schema and implement schema using data definition language and/or utilities.	CO 3	Remember
7	a	ACS553.13	Demonstrate serializability by taking various schedules.	CO 4	Remember
	b	ACS553.13	Illustrate various backup and recovery techniques for database systems.	CO 4	Remember
8	a	ACS553.13	Demonstrate serializability by taking various schedules.	CO 4	Remember
	b	ACS553.14	Gain knowledge on transaction processing to maintain consistency and integrity of data in database systems.	CO 4	Remember
9	a	ACS553.17	Analyze transaction processing, concurrency control, Database recovery techniques.	CO 5	Remember
	b	ACS553.18	Illustrate various lock based protocols.	CO 5	Understand
10	a	ACS553.19	Illustrate various backup and recovery techniques for database systems.	CO 5	Understand
	b	ACS553.20	Understand the concepts of update and shadow paging.	CO 5	Understand

Signature of Course Coordinator **HOD, EEE**