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Siddaganga Institute of Technology, Tumakuru – 572 103

(An Autonomous Institution affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Fifth Semester B.E. Information Science & Engg. Examinations Feb. 2021

Database Management System

Time: 3 Hours **Max. Marks: 100**

Note : Answer any five questions choosing one full question from each unit.

Unit - I

1 a) Explain the three-schema architecture with a neat diagram. Justify the need of mappings between schema levels. 6

BL:	2	CO:	1	PO:	3		

b) A university database contains information about professors (identified by a ssn) and courses (identified by a course ID). Each of the following situations concerns the relationship set between the teacher and the student. Draw an ER diagram for each situation (assuming that no further constraints hold).

i) Professors can teach the same course over several semesters and each offering must be recorded.
ii) Each professor teaches exactly one course.
iii) Each professor teaches atleast one course and some professors may teach multiple courses.
iv) Each professor teaches at least one course and professors must teach all the courses. 10

BL:	2	CO:	1	PO:	3		

c) Explain the advantages of Database approach. 4

BL:	2	CO:	1	PO:	3		

OR

2 a) Illustrate the different components of DBMS, with a neat diagram. 6

BL:	2	CO:	1	PO:	3		

b) Explain about the structural constraints with an example. 6

BL:	2	CO:	1	PO:	3		

c) Draw an ER diagram for BANK database. Assume the entities (minimum 4) and mention properly the constraints considered. 8

BL:	4	CO:	2	PO:	2		

Unit – II

3 a) Explain about union compatibility in SQL with suitable examples. 6

BL:	2	CO:	3	PO:	2		

b) Consider the following tables

BRANCH(branch-name:string, branch-city:string,assets:real)
ACCOUNT(accno:int, branch-name:string, balance:real)
DEPOSITOR(customer-name:string,accno:int)
CUSTOMER(customer-name:string,customer-street:string,customer-city:string)
LOAN(loan-number:int, branch-name:string,amount:real)
BORROWER(customer-name:string,loan-number:int)

Write SQL Queries for the following

i) List in alphabetical order all customers who have a loan at Perryridge branch.
ii) Find the names of all customers who street address includes the substring “Main”.
iii) List the loan numbers in descending order of amount.
iv) Find the average account balance at each branch. 8

BL:	4	CO:	3	PO:	2		

Please Turn Over

c) Differentiate between HAVING and where clause in SQL, with an example for each. 6

BL:	2	CO:	3	PO:	2		

OR

4 a) Discuss the six clauses in SQL query. What type of constraints cannot be specified with these clauses? 7

BL:	2	CO:	3	PO:	2		

b) Consider insurance database (primary key attributes are underlined):

Person(id#, name, city, street, street_number)
Car(license, model, year)
Accident(report#, date, city, street, street_number)
Owns(id#, license)
Participated(id#, license, rep#, damage_amt)

Write SQL queries for the following:

i) Update the damage amount for the car with license number **"AABB2000"** in the accident with report number **"AR2197" to $3000**.
ii) Count the no of cars participated in the accident.
iii) Display the no of cars owned by each driver. 9

BL:	4	CO:	3	PO:	2		

c) Define view and explain how to delete a view. 4

BL:	2	CO:	3	PO:	2		

Unit – III

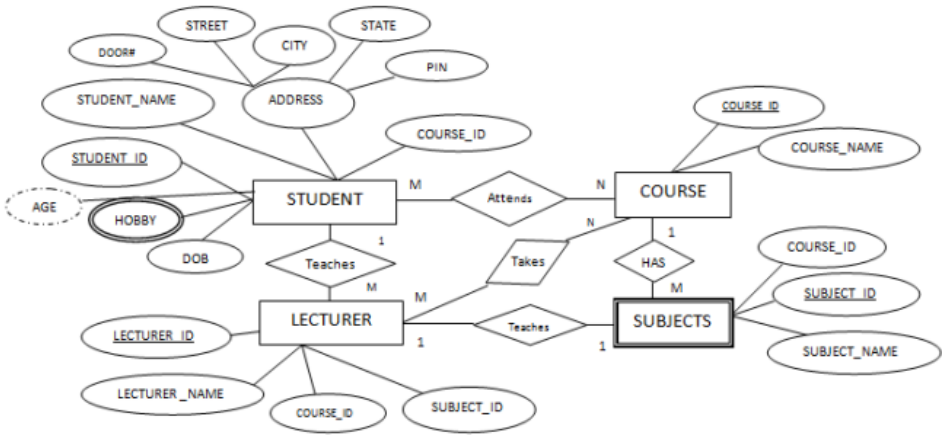
5 a) Consider the relational database where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries.

SAILORS(Sid, Sname, rating, age)
BOATS(bid, bname, color)
RESERVES(Sid, bid, day)

i) Find the names of sailors who've reserved all boats.
ii) Find the average age for each rating, and order results in ascending order on sid.
iii) Find the names of sailors who've reserved only red boats.
iv) Find the names of sailors who've reserved a red or a green boat. List names and the boat color. Find names of sailors who've reserved a red and a green boat. 10

BL:	4	CO:	3	PO:	2		

b) Explain the mapping of binary 1:N relationship and binary M:N relationship types of ER diagrams to relations. Convert the given ER diagram into relational schema.



10

BL:	4	CO:	2	PO:	2		

OR

6 a) Explain the entity integrity and referential integrity constraints with examples. 6

BL:	2	CO:	3	PO:	2		

b) Consider the following tables

EMPLOYEE(person-name, street, city)

WORKS(person-name, company-name, salary)

COMPANY(company-name, city)

MANAGES(person-name, manager-name)

Write Relational algebraic queries for the following:

i) Find the names of all employees who work for First Bank Corporation.

ii) Find the names and cities of residence of all employees who work for First Bank Corporation.

iii) Find the names, street address, and cities of residence of all employees who work for First Bank Corporation and earn more than $10,000 per annum.

iv) Find the names of all employees in this database who live in the same city as the company for which they work. 8

BL:	3	CO:	2	PO:	2		

c) Explain the set operations in Relational Algebra. 6

BL:	2	CO:	2	PO:	2		

Unit – IV

7 a) Let R(A,B,C,D,E,G,H) be a relation schema with set of functional dependencies:
F={AB→C, B→D, CD→E, CE→GH, G→A}.
With the help of inference rules prove the following:

i) Exhibit a derivation of **AB→E** from F. ii) Exhibit a derivation of **GB→C** from F. 4

BL:	3	CO:	3	PO:	2		

b) Consider the universal relation R = {A, B, C, D, E, F, G, H, I, J} and the set of functional dependencies F = {{A, B}→C},{A}→{D, E}, {B}→{F}, {F→{G, H}, {D}→{I, J}}. What is the key for R? Decompose R into 2NF and then into 3NF relations. 8

BL:	4	CO:	4	PO:	3		

c) Explain the informal guidelines for a relational schema design. 8

BL:	2	CO:	2	PO:	2		

OR

8 a) Consider a relation with schema **R(A, B, C, D)** and FD's **{AB→C, C→D, D→A}**.

i) Indicate the nontrivial FD's that can be inferred from the given FD's?

ii) What are all candidate keys of R?

Is this relation in BCNF? If not Decompose R into 2NF, 3NF and BCNF relations. 10

BL:	3	CO:	4	PO:	3		

b) What is meant by denormalization? Discuss with an example. 6

BL:	2	CO:	4	PO:	3		

c) How is BCNF stronger than 3NF? Discuss with an example. 4

BL:	2	CO:	4	PO:	3		

Unit – V

9 a) What is a transaction? Discuss desirable properties of transaction. 8

BL:	2	CO:	5	PO:	2		

b) With a neat diagram write and explain the state transition diagram illustrating the states for transaction execution. 6

BL:	2	CO:	5	PO:	2		

c) Illustrate the CRUD operations in MongoDB. 6

BL:	2	CO:	1	PO:	3		

OR

10 a) Explain the problems which may encounter when transactions run concurrently with examples. 8

BL:	2	CO:	5	PO:	2		

b) Explain about the advantages of NoSQL. 6

BL:	2	CO:	1	PO:	3		

c) Explain in detail about the ACID properties in transaction processing. 6

BL:	2	CO:	5	PO:	2		

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