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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

V Semester B. E. Examinations Nov/Dec-15

Computer Science and Engineering

DATABASE MANAGEMENT SYSTEMS

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.

PART-A

1	1.1	List and briefly write the characteristics of database approach.	02
	1.2	Recall all *DBMS* languages briefly.	02
	1.3	Define Entity types and Entity sets.	02
	1.4	What are the types of relationship constraints?	02
	1.5	Summarize the set of operations used in relational algebra.	02
	1.6	Demonstrate attribute preservation condition of a decomposition.	02
	1.7	Define serial and non serial schedules.	02
	1.8	What is transaction timestamp?	02
	1.9	What are the control measures used to provide security of data in databases?	02
	1.10	What is meant by conflict equivalent and conflict serializable in schedules?	02

PART-B

2	a	What are data models, schemas and instances? Summarize the categories of data model.	08
	b	Notown Records has decided to store information about musicians who perform on its album (as well as other company data) in a database. As a database designer, draw the *ER* diagram with the following constraints: i) Each musician that records at Notown has an *SSN*, a name, an address and a phone number. Poorly paid musicians often share the same address, and no address has more than one phone. ii) Each instrument used in songs recorded at Notown has a *UID*, name and a musical key. iii) Each album recorded on the Notown label has a *UID*, title, a copyright date, a format and an album identifier. iv) Each song recorded at Notown has a title and an author. v) Each musician may play several instruments and a given instrument may be played by several musicians. vi) Each album has a number of songs on it, but no song may appear on more than one album. vii) Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.	08

OR

3	a	Explain the advantages of *DBMS* approach.	08
	b	Explain the following terms, with examples, briefly: i) Overlap constraint; ii) Role indicator; iii) Aggregation; iv) Stored and derived attribute.	08
4	a	Suppose that we have a ternary relationship R between entity sets A, B and C such that A has a key constraint and total participation and B has a key constraint; these are the only constraints. A has attributes a_1 and a_2, with a_1 being the key, B and C are similar. R has no descriptive attributes. Write *SQL* statements that create tables corresponding to this information so as to capture as many of the constraints as possible.	08
	b	Consider the following relations: *Student*(*Snum*: *integer*, *Sname*: *string*, *major*: *string*, *Level*: *string*, *age*: *integer*) *Class*(*name*: *string*, *meets_at*: *string*, *room*: *string*, *fid*: *int*) *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. i) Find the names of all juniors (level = *JR*) who are enrolled in a class taught by I.Teach. ii) Find the age of the oldest student who is either a History major or enrolled in a course taught by I.Teach. iii) Find the names of all classes that either meet in room *R128* or have five or more students enrolled.	08
		OR	
5	a	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*) Write the following queries in *SQL*: i) Find the names of the suppliers who supply some red part. ii) Find the Sids of suppliers who supply some red or green part. iii) Find the Sids of suppliers who supply some red part or are at 221 Parker street.	
	b	Consider the following relations containing airline flight information: *Flights*(*flno*: *integer*. *from*: *string*, *to*: *string*, *distance*: *integer*, *departs*: *time*, *arrives*: *time*) *Aircraft*(*aid*: *integer*, *aname*: *string*, *cruising range*: *integer*) *Certified*(*eid*: *integer*, *aid*: *integer*)' *Employees*(*eid*: *intetger*, *ename*: *string*, *salary*: *integer*) Note that employees relation describes pilots and other kinds of employees as well; every pilot is certified for some aircraft (otherwise, he or she would not qualify as a pilot), and only pilots are certified to fly. Write *SQL* queries for: i) Find the ids of pilots certified for some Boeing aircraft. ii) Find the names of pilots certified for some Boeing aircraft. iii) Find the aids of all aircraft that can be used on non-stop flights from Bonn to Madras.	08

6	a	Explain the following terms: Embedded *SQL, JDBC, SQLJ*, stored procedure.	04
	b	Explain all the informal measures of quality for relational schema design.	08
	c	What is equivalence of sets and minimal sets of functional dependencies? Discuss.	04
		OR	
7	a	What is the difference between *JDBC* and *SQLJ*? Why do they both exist?	04
	b	List and prove all inference rules for functional dependencies.	12
8	a	Define the terms: Blind Write, Dirty Read, Serializable Schedule, Recoverable Schedule.	08
	b	State and justify Thomas Write Rule.	04
	c	Explain *ACID* property of transaction database.	04
		OR	
9	a	Explain *ARIES* Recovery algorithm with an example.	08
	b	How is dead lock prevention done in scheduling? Explain Briefly.	08
10	a	Record-level logging increases concurrency. What are the potential problems and how does *ARIES* address them? Explain Briefly.	06
	b	What is shadow paging? Explain.	04
	c	How is check pointing done in *ARIES*? Explain.	06
		OR	
11	a	What is *LSN* of a log record? What are the different types of log records and when are they written? Explain Briefly.	08
	b	Explain Grant and Revoke on views and integrity constraints with examples.	08

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V Semester B. E. Examinations Nov/Dec-14

Computer Science and Engineering

DATABASE MANAGEMENT SYSTEMS

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.

PART-A

1	1.1	Define mapping in three schema architecture.	02	CO1
	1.2	What is identifying relationship?	02	CO2
	1.3	Define the term data integrity and mention its types.	02	CO1
	1.4	When are two relations said to be union compatible? Give an example.	02	CO2
	1.5	Which command is used for creating user-defined data types? Give an example.	02	CO4
	1.6	List the different types of attributes in a relation.	02	CO3
	1.7	Define *BCNF*.	02	CO1
	1.8	Define a transaction.	02	CO3
	1.9	What is log record buffering?	02	CO2
	1.10	Define authorization propagation.	02	

PART-B

2	a	Explain the various functional components of a *DBMS* with the help of a suitable diagram.	08	CO1
	b	Explain the different criteria on the basis of which *DBMS* is classified into different categories.	08	CO1
		OR		
3	a	Design an *ER*-diagram for an *IT* training group database that will meet the information needs for its training program. Clearly indicate the entities, relationships and the key constraints. The description of the environment is as follows: The company has 12 instructors and can handle up to 100 trainees for each training session. The company offers 5 advanced technology courses, each of which is taught by a team of 2 or more instructors. Each instructor is assigned to a maximum of two teaching terms or may be assigned to do research. Each trainee undertakes one advanced technology course per training session.	10	CO2
	b	Define the following terms: *SDL, TCL, DDL, DML, VDL, SQL*.	06	CO1

4 a Discuss the entity integrity and referential integrity constraints. Why is each considered important? 6

b Generate the relational algebra for the following queries considering the following tables of a database: 6

Hotel (hotelNO, hotelName, city)
Room (roomNo, hotelNO, type, price)
Booking (hotelNo, guestNO, dateFrom, dateTo, roomNo)
Guest (guestNo, guestName, guestAddress)

i) List all single rooms with a price below *Rs. 2000* per night
ii) List the names and address of all guests;
iii) List the price and type of all rooms at the Grosvernor Hotel;
iv) List all guests currently staying at the Grosvernor Hostel;
v) List all hotels 10

OR

5 a What are insertion, deletion and modification anomalies? Why are they considered bad? Illustrate with examples. 06

b Consider a relation $R(A, B, C, D, E)$ with $F = \{A -> B, BC -> E, ED -> A\}$

i) List all keys for R;
ii) Is R in *3NF*?;
iii) Is R in *BCNF*? 08

6 a Why is it not straight forward to integrate *SQL* queries with a host programming language? 03

b How are variables declared in Embedded *SQL*? 03

c Consider the following schema for a *LIBRARY* database:

BOOK (Book_id, Title, Publisher_name)
BOOK_AUTHORS (Book_id, Author_name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Branch_id, No_of_copies)
BOOK_LOANS (Book_id, Branch_id, Card_no, Date_out, Due_date)
LIBRARY_BRANCH (Book_id, Branch_Name, Address)
BORROWER (Card_no, Name, Address, Phone)

Write SQL queries for the following:

i) How many copies of the book titled The Lost Tribe are owned by the library branch whose name is "Sharpstown"?
ii) How many copies of the book titled The Lost Tribe are owned by each library branch?
iii) Retrieve the names of all borrowers who do not have any books checked out.
iv) For each book that is loaned out from the "Sharpstown" branch and whose DueDate is today, retrieve the book title, the borrower's name, and the borrower's address.
v) For each library branch, retrieve branch name and the total number of books loaned out from that branch. 10

OR

7 a What are nested queries? What is correlation in nested queries? 03

b How are the operators *IN, EXISTS, UNIQUE, ANY* and *ALL* used in writing nested queries? Write queries for each with an example. 10

c How is *JDBC* driver loaded in Java Code? Give an example. 03

8	a	What are the ACID properties? Illustrate them with example	10
	b	What is a lock? Describe the types of locks used in concurrency control	03
	c	How does a schedule end up in deadlock? Illustrate with an example	03

OR

9	a	Consider the three transactions *T1, T2 and T3* and the schedules S1 and S2 given below. Draw the serializability (precedence) graphs for S1 and S2 and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s). *T1*: $r1(X); r1(Z); w1(X);$ *T2*: $r2(Z); r2(Y); w2(Z); w2(Y);$ *T3*: $r3(X); r3(Y); w3(Y);$ *S1*: $r1(X); r2(Z); r1(Z); r3(X); r3(Y); w1(X); w3(Y); r2(Y); w2(Z); w2(Y);$ *S2*: $r1(X); r2(Z); r3(X); r1(Z); r2(Y); r3(Y); w1(X); w2(Z); w3(Y); w2(Y);$	
	b	Describe the three steps in crash recovery in *ARIES*.	10 06
10	a	What is the main idea behind discretionary access control and mandatory access control? What are the relative merits of these two approaches? Explain.	08
	b	Discuss how time is represented in temporal databases and compare the different time dimensions.	04
	c	How do spatial databases differ from regular databases? Discuss the different categories of spatial queries.	04

OR

11	a	Briefly explain the control measures that are used to provide security of data in databases.	08
	b	Explain, with examples, the different triggered actions that occur before, after or concurrently with the triggering event.	08

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V Semester B. E. Examinations Nov/Dec-16

Computer Science and Engineering

DATABASE MANAGEMENT SYSTEMS

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.

PART-A

1 1.1 What are the requirements for relation to be called union compatible? 02

1.2 Add one word in the *SQL* expression to list "customer_name" from a *CUSTOMER* table having atleast three characters and having the 2nd and 3rd characters as *I* and *N* respectively. 02

select customer_name from CUTOMER where customer_name like _ _

1.3 The following table has two attributes *A* and *C* where *A* is the primary key and *C* is the foreign key referencing *A* with on-delete cascade. 01

A	C
2	4
3	4
4	3
5	2
7	2
9	5
6	4

Find and write the set of all tuples that must be additionally deleted to preserve referential integrity when the tuple (2,4) is deleted. 02

1.4 The employee information in a company is stored in the relation. What does the following query return? 02

EMPLOYEE(name, sex, salary, deptName)

Consider the following *SQL* query:

Select deptName from EMPLOYEE where sex = 'M' groupby deptName
having avg(salary) > (select avg(salary) from EMPLOYEE).

1.5 Identify the need for mapping between Schema levels. 02

1.6 List any two user friendly interfaces used in data base packages. 02

1.7 Consider the relation $r(x, y, z, w)$ and a set $\{y \rightarrow w, xy \rightarrow z\}$ where the symbol $y \rightarrow w$ means $y \rightarrow w$ and $w \rightarrow y$ simultaneously. What are the candidate keys of *R*? What is the highest normal form of relation? 02

1.8 Consider a relation with schema $R(A, B, C, D)$ and *FDs* $A \rightarrow C$; $BC \rightarrow D$, $D \rightarrow C$ and $AD \rightarrow B$. Find the closures for subsets *AC* and *AD* respectively. 02

1.9 The total number of attributes 'n' of a relation schema *R* is called as _ _ _ _ of a relation. 01

1.10 Identify the need for *DBMS* to 'maintain' the database systems. 01

1 .1 are the systems with large databases and hundreds of 0

1 12 concurrent users executing database transactions. 0
and are the two main strategies that can be employed
when flushing a modified buffer back to disk

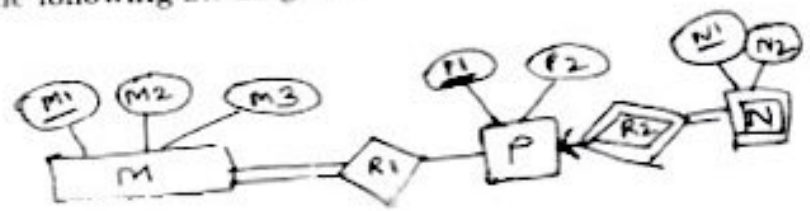
PART-B

2 a Discuss the main characteristics of the database approach and how it 0
differs from traditional file systems

b Consider a database company Artbase that builds a product for art galleries. Galleries keep information about artists, their names (which are unique), birthplaces, age and style of art. For each piece of artwork, the artist, the year it was made, its unique title, its type of art and its price must be stored. Pieces of artwork are also classified into various kinds, for example: portraits, still lifes, works by Picasso or works of the 19th century. A given piece may also belong to more than one group. Each group is identified by a name that describes the group. Finally, galleries keep information about customers. For each customer, galleries keep that person's unique name, address, total amount of dollars spent in the gallery, and the artists and groups of art that the customer tends to like. Draw the *ER* diagram for the database.

OR

3 a Consider the following *ER* diagram



What is the minimum number of tables needed to represent M, N, R, P, R_1, R_2. Describe the schema of each table.

b Categorize the end users of the database system and also discuss their activities.

c Define the following terms with an example
i) Candidate key;
ii) Primary key;
iii) Foreign key;
iv) Super key.

4 a Use complete set of Relational Algebra Operations to derive division operation. Discuss with an example.

b For the database schema given below:
STUDENT(Name, Studentnumber, Class, Major)
COURSE(Coursename, Coursenumber, Credit_hrs, Department)
SECTION(SecId, Coursenumber, Semester, Year, Instructor)
GRADEREPORT(Studentnumber, SecId, Grade)
PREREQUISITE(Coursenumber, prerequisitenumber).

Use *SQL* to

i) Retrieve the names of all senior students (above class = 7) majoring in *CS* — 02

ii) Retrieve the names of all courses taught by professor King in 1998 and 1999 — 03

iii) For each section taught by Professor King, retrieve the course number, credit hours, course name, semester, year and the number of students who took the section. — 03

OR

5 a Discuss the following relational algebra operators. Illustrate them with an example for each.
EQUIJOIN, NATURAL JOIN, UNION, SET DIFFERENCE — 08

b Consider the following relational schema.
EMP(eid : integer, ename: string, age: integer, salary: real)
WORKS(eid : integer, did : integer, Pcttime: integer)
DEPT(did: integer , dname: string, budget : real, managerid : integer).
Use *SQL* statements for the following:

i) Give an example of a foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when the user attempts to delete a Dept tuple?

ii) Write *SQL* statements required to create *EMP* and *DEPT*, including appropriate versions of all Primary and Foreign key integrity constraints. — 4+4

6 a Consider the following relation:
STUDENT(Student_id, First_name, Last_name, Major_id, Degree_id, Major_name, Degree_name, Address)
Student_id determines all other attributes, Major_id determines Major_name and Degree_id determines Degree_name. Is the student relation in *BCNF*? If it is so, explain why, if it is not, convert it to *BCNF*. — 06

b Describe the need for Normalization? Explain the first and second *NF*. — 08

c Discuss the problem of spurious tuples. — 02

OR

a Explain informal design guidelines for relation schema. — 08

b A relation *R* has four attributes *A, B, C, D*. For each of the following sets of *FD*, identify the candidate key and the highest *NF*:

i) $C \rightarrow D$, $C \rightarrow A$, $B \rightarrow C$

ii) $B \rightarrow C, D \rightarrow A$.

7 a Explain the properties of a transaction with state transition diagram. — 08

b Why is concurrency control needed? Explain major problems with suitable examples. — 08

OR

a Demonstrate two-phase locking techniques used for concurrency control. — 08

b Discuss the *ACID* property of transactional database. — 08

10 a

b Explain all the phases involved in AR... algorithm with an example. Explain the terms Steal and no steal approach in Standard DBMS recovery schemes

OR

11 a With an example, explain the concept of mandatory access control and role based access control for multi level security

b Describe the shadow paging recovery technique.

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VI Semester B. E. Examinations May/June-14

Computer Science and Engineering

DATABASE MANAGEMENT SYSTEMS

Time: 03 Hours *Maximum Marks: 100*

Instructions to candidates:

1 Answer all questions from Part A. Part A questions should be answered in the first three pages of the answer book only.

2 Answer FIVE full questions from Part B.

PART-A

1	1.1	What are the implicit properties of a database? (any two properties)	02
	1.2	Database management system is a general purpose software system that facilitates the processing of and database among various users and applications.	02
	1.3	What is the difference between controlled and uncontrolled redundancy?	02
	1.4	What is the difference between a database schema and database state?	02
	1.5	What is the difference between a key and a superkey?	02
	1.6	Mention two pattern matching symbols used *in SQL*.	02
	1.7	How are *SQL* statements used within a host language?	02
	1.8	What are the uses of functional dependencies?	02
	1.9	Define third normal form.	02
	1.10	When are two schedules conflict equivalent?	01
	1.11	What is the *LSN* of a log record?	01

PART-B

2	a	A *BANK* wants to keep track of different types of *ACCOUNTS* (*SAVINGS_ACCTS, CHECKING_ACCTS, ...*) and *LOANS* (*CAR_LOANS, HOME_LOANS, ...*). Suppose it is also desirable to keep track of each account's *TRANSACTIONs* (*deposits, withdrawals, checks, ...*) and each loan's *PAYMENT*s; both of these include the amount, date, time, ... Draw the EER diagram concepts of specialization and generalization. State any assumptions you make about the additional requirements.	08
	b	What are the advantages of *DBMS*? Explain.	08
		OR	
3	a	Construct an *ER* diagram (including important attributes) for a car insurance database that includes data about customers (car owners), cars and accidents, drivers involved in accidents and injured drivers and/or passengers. Note that any customer can insure many cars, each car may have different drivers at different times and accidents typically involve one or more cars. Draw the schema for the same.	10
	b	What are the two constraints applied to a specialization? Discuss their usage.	06

4	a	Consider the following relation schema for a university database: *PROFESSOR (Pid, Pname, Deptid)* *COURSE (Cid, Deptid, Cname, Syllabus)* *PROF_COURSE (Pid, Cid, Semester)* Create the above tables by identifying the primary and foreign keys for this schema. Now populate these relations with some tuples, and then give examples of insertion in the *PROF_COURSE* relation that violates the referential integrity constraints and of another that does not. Identify what you think should be the various candidate keys for this schema. Make assumptions wherever necessary	08	L2
	b	Explain the characteristics of relations noting relevant examples.	08	L2
		OR		
5	a	Define the term data integrity and explain its types.	08	L2
	b	How are entity types and attributes mapped to relation schemas? Explain with the help of an example.	08	L2
6	a	Explain the informal guidelines for a relational schema design.	08	L2
	b	Consider the universal relation $R(A,B,C,D,E,F,G,H,I,J)$ and the set of functional dependencies: $AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ$ What is the key for R? Decompose R into $2NF$ and $3NF$ relations.	08	L3
		OR		
7	a	Define $2NF, 3NF, BCNF$ and $4NF$.	08	L2
	b	Discuss join dependency and the $5NF$ with examples.	08	L2
8	a	Why is it desirable to have concurrent execution of multiple transactions? What are the various anomalies that can occur due to undesirable interleaving of transactions? Explain by giving suitable examples.	08	L2
	b	Discuss the precedence graph with an example in locking technique.	08	L2
		OR		
9	a	Discuss the concept of conflict equivalence & serilizable and view equivalence & serializable.	08	L2
	b	Discuss basic time stamp ordering. How is it different from strict timestamp ordering protocol?	08	L2
10	a	Explain the recovery techniques based on deferred update and immediate update.	08	L2
	b	What is access control? Discuss two approaches for access control in *DBMS*.	08	L2
		OR		
11	a	How does the *ARIES* recovery algorithm maintain a log file and checkpoints? Discuss.	08	L2
	b	What are multilevel relations? Explain these terms in context of multilevel relations apparent key, filtering and covert channel.	08	L2