[4066] - 302
M.C.A. (Engineering Faculty)
DATABASES : CONCEPTS AND SYSTEMS
(Sem. - III) (2008 Course) (610902)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:
1) *Section I : Q1 or Q2, Q3 or Q4, Q5 or Q6.*
2) *Section II : Q7 or Q8, Q9 or Q10, Q11 or Q12.*
3) *Answers to the two sections should be written in separate books.*
4) *Neat diagrams must be drawn wherever necessary.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain advantages and disadvantages of Hierarchical Data Model and Network Data Model. **[5]**

b) Describe the Role of Query Processor and Database Administrator.**[6]**

OR

Q2) a) Explain in brief different levels of abstraction. Consider a two dimensional integer array of size n x m that is to be used in your favorite programming language. Using array as an example, illustrate the difference between the three levels of abstraction. **[5]**

b) Describe System Catalog in detail. **[6]**

Q3) a) Notown Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database. The company has wisely chosen to hire you as a database designer (at your usual consulting fee of $2500/day).

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. Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat,E-flat). Each album recorded on the Notown label has a unique identification number, a title, a copyright date, a format (e.g., CD or MC), and an album identifier. Each song recorded at Notown has a title and an author. Each musician may play several instruments, and a given instrument may be played by several musicians.

P.T.O.

b) Explain different Relational Keys with suitable example. [4]

OR

Q6) a) Explain intension and extension of Relation with suitable example. [6]

b) Explain codd's comprehensive sub-language rules. [6]

SECTION - II

Q7) a) The following relations keep track of airline flight information : [10]

Flights(*flno:* integer, *from:* string, *to:* string, *distance:* integer, *departs:* time, *arrives:* time, *price:* real)

Aircraft(*aid:* integer, *aname:* string, *cruisingrange:* integer)

Certified(*eid:* integer, *aid:* integer)

Employees(*eid:* integer, *ename:* string, *salary:* integer)

Note that the Employees relation describes pilots and other kinds of employees as well; every pilot is certified for some aircraft, and only pilots are certified to fly.

Write each of the following queries in SQL.

i) Find the names of aircraft such that all pilots certified to operate them have salaries more than $80,000.

ii) Identify the routes that can be piloted by every pilot who makes more than $100,000.

iii) Print the *enames* of pilots who can operate planes with *cruisingrange* greater than 3000 miles but are not certified on any Boeing aircraft.

iv) A customer wants to travel from Madison to New York with no more than two changes of flight. List the choice of departure times from Madison if the customer wants to arrive in New York by 6 p.m.

b) Explain advantages and disadvantages of PL/SQL. [2]

OR

Q8) a) Explain REF cursor in PL/SQL with suitable example. [4]

b) Write short notes on : [8]

i) Stored Procedure and Stores Function

ii) Embedded SQL

Q9) a) "Let R be a relation schema with a set F of FDs. Prove that the decomposition of R into Rl and $R2$ is lossless-join if and only if $F+$ contains $R1 \cap R2 \rightarrow R1$ or $R1 \cap R2 \rightarrow R2$. **[7]**

b) Write a short note on Prototyping in database application. **[4]**

OR

Q10) a) Suppose you are given a relation R with four attributes $ABCD$. For each of the following sets of FDs, assuming those are the only dependencies that hold for R, do the following: (a) Identify the candidate key(s) for R. (b) Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF). (c) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies. **[7]**

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

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

    iii) $ABC \rightarrow D, D \rightarrow A$

    iv) $A \rightarrow B, BC \rightarrow D, A \rightarrow C$

    v) $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B$

b) What is a minimal cover for a set of FDs? Describe an algorithm for computing the minimal cover of a set of FDs, and illustrate it with an example. **[4]**

Q11) a) Consider a database with objects X and Y and assume that there are two transactions Tl and $T2$. Transaction $T1$ reads objects X and Y and then writes object X. Transaction $T2$ reads objects X and Y and then writes objects X and Y. **[8]**

    i)   Give an example schedule with actions of transactions $T1$ and $T2$ on objects X and Y that results in a write-read conflict.

    ii)   Give an example schedule with actions of transactions $T1$ and $T2$ on objects X and Y that results in a read-write conflict.

    iii) Give an example schedule with actions of transactions .$T1$ and $T2$ on objects X and Y that results in a write-write conflict.

    iv) For each of the three schedules, show that Strict 2PL disallows the schedule.

b) Describe Timestamp protocol for concurrency control. **[4]**

OR

Q12) Write a short note on : **[12]**

    a) Fuzzy CheckPoint

    b) Deadlocks Prevention

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Each album has a number of songs on it, but no song may appear on more,than one album. Each song is performed by one or more musicians, and a musician may perform a number of songs. Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.

Design a conceptual schema for Notown and draw an ER diagram for your schema. The preceding information describes the situation that the Notown database must model. Be sure to indicate all key and cardinality constraints and any assumptions you make. Identify any constraints you are unable to capture in the ER diagram and Briefly explain why you could not express them. **[9]**

b) Describe significance of Disjoint and Overlapping design constrains.**[3]**

OR

Q4) a) Draw ER Diagram for Company enterprises which should be consist of Entity sets, attributes, relationships, mapping cardinality and keys, aggregation, specialization, Role, and Generalization. It will maintain information about all departments, Employees, Products, Raw Materials, Customers, Suppliers, All defects etc. **[9]**

b) Explain strong entity set and weak entity set with suitable example. **[3]**

Q5) a) Briefly answer the following questions based on this schema: **[8]**

Emp*(eid:* integer, *ename:* string, *age:* integer, *salary:* real)
Works*(eid:* integer, *did:* integer, *pct time:* integer)
Dept*(did:* integer, *budget:* real, *managerid:* integer)

i) Suppose you have a view SeniorEmp defined as follows:

CREATE VIEW SeniorEmp (sname, sage, salary)
AS SELECT E.ename, E.age, E.salary
FROM Emp E
WHERE E.age > 50

Explain what the system will do to process the following query :
SELECT S.sname
FROM SeniorEmp S
WHERE S.salary > 100,000

ii) Give an example of a view on Emp that could be automatically updated by updating Emp.

iii) Give an example of a view on Emp that would be impossible to update automatically) and explain why your example presents the update problem that it does.