

MCA (III Year)
Term-End Examination
December, 2007

**CS-15 : RELATIONAL DATABASE
MANAGEMENT SYSTEM**

Time : 3 hours

Maximum Marks : 75

Note : Question number 1 is **compulsory**. Answer any **three** questions from the rest.

1. (a) The company M-Series has decided to store information about musicians who perform on its albums in a database. The company has wisely chosen to hire you as a database designer :
- (i) Each instrument used in songs recorded at M-Series has a name (e.g. guitar, synthesizer, flute) and a musical key (e.g. C, B-flat, E-flat).
 - (ii) Each musician that records at M-Series has a 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.

- (iii) Each album recorded at M-Series has a title, a copyright date, a format and an album identifier.
- (iv) Each song recorded at M-Series 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 song is performed by one or more musicians and a musician may perform a number of songs.
- (viii) Each album has exactly one musician who acts as its producer. A musician may produce several albums.

Design an ER diagram for M-Series.

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- (b) List all the functional dependencies satisfied by the following relation :

6

A	B	C
a ₁	b ₁	c ₁
a ₁	b ₁	c ₂
a ₂	b ₁	c ₁
a ₂	b ₁	c ₃

(c) With the help of example transactions, explain the concurrency control scheme based on timestamp-based ordering. 8

(d) Explain all the integrity constraints occurring in relational databases using an example of each. 6

2. (a) "The algorithm to detect a deadlock is based on the detection of a circular chain in the wait-for-graph." With the help of an example, explain the deadlock detection algorithm. 8

(b) What is the major disadvantage of Index-sequential organizations ? Explain how this disadvantage is overcome using Virtual storage access method (VSAM). 7

3. (a) Consider the following relations : 9

P :

Eid	Ename
1001	Evan
1012	Brew
1014	Kinder
1015	Bryan
1017	Brooks
1020	John

Q :

Eid	EName
1012	Brew
1014	Kinder
1016	Seth
1017	Brooks

Find the following :

(i) $P \cup Q$

(ii) $P - Q$

(iii) $P \cap Q$

(iv) $P \times Q$

(b) Consider the universal relation

$R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies

$$F = \{\{A, B\} \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \\ \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\}\}$$

(i) Find the key for R.

(ii) Decompose R into 2NF. 6

4. (a) With the help of an example explain redundancy, update anomalies, insertion anomalies and deletion anomalies. 8

(b) What problems occur in the database systems when transactions do not satisfy ACID properties ? Explain explicitly using suitable examples (wherever necessary). 7

5. Write short notes on the following : 5×3=15

(i) Generalization and Aggregation

(ii) Importance of BCNF

(iii) Granularity of locking

(iv) Audit Trails

(v) Project Join Normal Form