

B.Tech 5th Semester Exam., 2019

DATABASE SYSTEM

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Answer the following as directed (any seven) :

2×7=14

- (a) _____ play an important role in defining and maintaining a database for an organization.

(Fill in the blank)

- (b) The strong entity type and weak entity type participate in _____ relationship.

(Fill in the blank)

- (c) A level that describes how a record is stored is

- ~~(i) physical~~
- (ii) logical
- (iii) user
- (iv) view

(d) Which of the following is true?

- (i) Every relation in 3NF is also in BCNF
- (ii) A relation R is in 3NF if very non-prime attribute of R is fully functionally dependent on every key of R
- ~~(iii) Every relation in BCNF is also in 3NF~~

- (iv) No relation can be in both BCNF and 3NF

(Choose the correct option)

- (e) Consider the relation scheme $R = \{E, F, G, H, I, J, K, L, M, N\}$ and the set of functional dependencies

$$\{ \{E, F\} \rightarrow \{G\}, \{F\} \rightarrow \{I, J\}, \{E, H\} \rightarrow \{K, L\}, K \rightarrow \{M\}, L \rightarrow \{N\} \}$$
on R . What is the key for R ?

- (i) $\{E, F\}$
- ~~(ii) $\{E, F, H\}$~~
- (iii) $\{E, F, H, K, L\}$
- (iv) $\{E\}$

(Choose the correct option)

(3)

- (f) Given the Students' relation as shown below :

StudentID	StudentName	StudentE-mail	StudentAge	CPI
2345	Shankar	shankar@math	X	9.4
1287	Swati	swati@ee	19	9.5
7853	Shankar	shankar@cse	19	9.4
9876	Swati	swati@mech	18	9.3
8765	Ganesh	ganesh@civil	19	8.7

For (StudentName, StudentAge) to be the key for this instance, the value X should not be equal to

- (i) 18
- (ii) 19
- (iii) 15
- (iv) 20

(Choose the correct option)

- (g) From the instance of a relation scheme R (A, B, C)

A	B	C
1	1	1
1	1	0
2	3	2
2	3	2

we can conclude that

- (i) A functionally determines B and B functionally determines C

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- (ii) A functionally determines B and B does not functionally determine C
- (iii) B does not functionally determine C
- (iv) A does not functionally determine B and B does not functionally determine C

(Choose the correct option)

- (h) Data base is generally

- (i) system centered
- (ii) user centered
- (iii) company centered
- (iv) data centered

(Choose the correct option)

- (i) The restriction placed on data is said to be

- (i) relation
- (ii) attribute
- (iii) parameter
- (iv) constraint

(Choose the correct option)

- (j) An object in databases is equal to ____ + relationships.

- (i) data
- (ii) attribute
- (iii) entity
- (iv) constraint

(Choose the correct option)

2. (a) Draw and explain the three-level architecture of the database system. 7
- (b) Compare the traditional file-based systems and relational database management system approaches. 7
3. (a) What is a view? Can we update a view? Justify your answer. 4
- (b) When we try to modify any table in database system, we encounter some side-effects if the tables are insufficiently normalized. Can you explain those side-effects with the respective examples? 5
- (c) List out various constraints in relational model and explain in short. 5
4. (a) Discuss the correspondence between E-R model construct and the relation model construct. Show how each E-R model construct can be append to the relational model using the following description of an organization : 10
- An organization uses number of items of an equipment to produce goods. Each item is at one LOCATION, of one TYPE and has a DETAILED_DESCRIPTION. Faults on the equipment are identified by a unique FAULT_ID and are reported at a TIME_REPORTED. Any number of

persons may be assigned to a fault and work on the fault until it is fixed. The TIME_FIXED is recorded as the TIME_SPENT by each person on a fault. Any number of parts may be used to repair a fault. The QTY_USED of each part is recorded against the fault. Each part is identified by a PART_ID and has a given weight and MAX_DIMENSION and can have any number of colors.

- (b) Write a short note on types of attributes and their representation in E-R model with neat figures. 4
5. Considering the following schema, create the appropriate tables and insert at least 5 records :

AUTHOR (author-id, name, city, country)

PUBLISHER (publisher-id, name, city, country)

CATALOG (book-id, title, author-id, publisher-id, category-id, year, price)

CATEGORY (category-id, description)

ORDER-DETAILS (order-no, book-id, quantity)

Write each of the following queries in SQL and relational algebra :

- (a) Obtain the names of authors who have 2 or more books in the catalog.

- (b) Find the author of the book which has maximum sales.
- (c) Obtain the names of author who have maximum number of publisher.
- (d) Obtain the name of the city, author, publisher where publisher and author belong to same city.
- (e) Obtain the title of books which has maximum sales.
- (f) Obtain the book-id, description for the author who have exactly 3 books in the catalog.
- (g) Obtain the author and publisher who have published books in more than or equal to 2 categories. 14
6. (a) You are given the following set F of functional dependencies for a relation :
 $R(A, B, C, D, E, F) : F = \{ABC \rightarrow D, ABD \rightarrow E, CD \rightarrow F, CDF \rightarrow B, BF \rightarrow D\}$
- (i) Find all keys of R based on these functional dependencies.
- (ii) Is this relation in Boyce-Codd normal form? Is it 3NF? Explain your answer.
- (iii) Can the set F be simplified (by removing functional dependencies or by removing attributes from the left-hand side of functional dependencies) without changing the closure of F (i.e. F^+)? 9

(Turn Over)

- (b) Compute the closure of the following set F of functional dependencies for relation schema :
- $R = (A, B, C, D, E). A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A$
- List the candidate keys for R . 5
7. (a) What is the need of normalization? How many types of normalization exist? Explain in detail with suitable examples. 8
- (b) What is trigger? When are they used and why? Explain. 6
8. (a) For the following set of key values construct a B^+ tree with a degree 4 :
 5, 10, 15, 29, 35, 46, 58, 63, 67, 89
- Initially tree is empty. Values must be added in ascending order. Show the step-by-step construction. 10
- (b) What is multilevel indexing? Explain in detail. 4
9. (a) What is two-phase locking protocol? Explain its working in detail. How can it guarantee serializability? 7
- (b) Discuss the various approaches for handling the deadlocks in dbms. 7
