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CS–502

B. TECH.

FIFTH SEMESTER EXAMINATION, 2002-2003

DATA BASE MANAGEMENT SYSTEM

Time : Two Hours   *Total Marks : 50*

Note : Attempt ALL questions.

1. Answer any FOUR of the following :—   (3×4 = 12)

    (*a*) Distinguish between a file-processing system and a DBMS.

    (*b*) What is the role of Database Administrator ?

    (*c*) Construct an E–R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient, a log of the various tests and examinations conducted.

    (*d*) Explain the distinction among the terms, primary key, candidate key and super key.

    (*e*) We can convert any weak entity set to a strong entity set by adding appropriate attribute. Why, then, do we have weak entity sets ?

    (*f*) What is the role of data independence in DBMS ?

2. This question contains **two** sections '*A*' and '*B*', each containing parts (*a*), (*b*) and (*c*). Attempt any FOUR parts, two each from sections '*A*' and '*B*' :—   (3×4 = 12)

    (*A*) Consider the following set of requirements for a Bank Database :—

"A large bank has several branches at different places. Each branch maintains the account details of the customers. The customers may open joint as well as single accounts. The bank also provides the loan to the customer for different purposes. Bank keeps record of each transaction by the customer to his account. All of the branches have employees and some employees are managers."

(*a*) Draw an E-R Diagram that captures this Information.

(*b*) Transform this E-R Diagram to Relational Database Schemas.

(*c*) Write SQL-DDL statement to implement Bank Database Schema.

(*B*) Consider the following Scheme :—

SUPPLIER (<u>SUPPLIER ID</u> , SUPPLIER_NAME, SUPPLIER_ADDRESS)

PARTS (<u>PART ID</u> , PART_NAME, COLOR)

CATALOG (<u>SUPPLIER ID, PART ID</u> , COST)

Write the following queries in Relational Algebra and SQL :—

(*a*) Find the name of the suppliers who supply Yellow Parts.

(*b*) Find the name of suppliers who supply both Blue and Green Parts.

(*c*) Find the name of suppliers who supply all Parts.

3. Answer any TWO of the following :— (6 × 2 = 12)

(*a*) What does unnormalized relation refer to ? Define Boyce-Codd normal form. How does it differ from third normal form ?

(*b*) Consider the scheme **R = (V, W, X, Y, Z).** Suppose, the following functional dependencies hold :—

$$Z \to V$$

$$W \to Y$$

$$XY \to Z$$

$$V \to WX$$

State whether the following decomposition of scheme **R** is loss less join decomposition. Justify your answer.

(*i*) R_1 = (**V, W, X**)

R_2 = (**V, Y, Z**)

(*ii*) R_1 = (**V, W, X**)

R_2 = (**X, Y, Z**)

(*c*) Consider the universal relation R = (A, B, C, D, E, F, G, H, I, J) and the set of functional dependencies F as given below :—

$$F = \{ AB \to C, A \to DE, B \to F, F \to GH, D \to IJ \}$$

(*i*) Determine the Key for R.

(*ii*) Decompose R into Second Normal Form.

4. Answer any TWO of the following :— (7 x 2 = 14)

(a) Consider the following two transactions :—

T_1 : read (A)
read (B)
if A = 0 then B : = B + 1
Write (B)

T_2 : read (B)
read (A)
if B = 0 then A : = A + 1
Write (A)

Let the consistency requirement be

A = 0 V B = 0

with A = B = 0 the initial values.

(i) Show that every serial execution involving these two transactions preserves the consistency of the database

(ii) Show a concurrent execution of T_1 and T_2 that produces a non-serializable schedule.

(iii) Is there a concurrent execution of T_1 and T_2 that produces a serializable schedule ?

(b) What is a recoverable schedule ? Why is recoverability of schedules desirable ? Are there any circumstances under which it would be desirable to allow non-recoverable schedules ?

(c) Explain the commit protocol with reference to distributed database. How does the 2PC protocol respond to various types of failures ?

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