REFNO:5964

Roll No. 20220CMH02

B.Sc. (Hons.) SEMESTER V EXAMINATION 2022-23

COMPUTER SCIENCE

CS - 107 : Database Management Systems

Time : Three hours | Max. Marks : 70

NOTE: Answer any Five questions. Each question carrying 14 marks.

1. A. Describe the three-schema architecture. Why do we need mappings between schema levels? [6]
   B. Discuss the main characteristics of the database approach and how it differs from traditional file systems. [8]

2. A. Explain the differences among an entity, an entity type, and an entity set. [6]
   B. Consider the following set of requirements for a university database that is used to keep track of students' transcripts: [8]

   - The university keeps track of each student's name, student number, social security number, current address and phone, permanent address and phone, birthdate, sex, class (freshman, sophomore, . . ., graduate), major department, minor department (if any), and degree program (B.A., B.S., . . ., Ph.D.). Some user applications need to refer to the city, state, and zip code of the student's permanent address and to the student's last name. Both social security number and student number have unique values for each student.
   - Each department is described by a name, department code, office number, office phone, and college. Both name and code have unique values for each department.
   - Each course has a course name, description, course number, number of semester hours, level, and offering department. The value of course number is unique for each course.
   - Each section has an instructor, semester, year, course, and section number. The section number distinguishes sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, . . ., up to the number of sections taught during each semester.
   - A grade report has a student, section, letter grade, and numeric grade (0, 1, 2, 3, or 4).

   Design an ER schema for this application and draw an ER diagram for that schema. Specify key attributes of each entity type and structural constraints on each relationship type. Note any unspecified requirements and make appropriate assumptions to make the specification complete.

3. A. Discuss the entity integrity and referential integrity constraints. Why is each considered important? [6]
   B. Consider the following six relations for an order processing database application in a company: [8]

   CUSTOMER (Cust#, Cname, City)

   ORDER (Order#, Odate, Cust#, Ord_Amt)

   ORDER_ITEM (Order#, Item#, Qty)

   ITEM (Item#, Unit_price)

   SHIPMENT (Order#, Warehouse#, Ship_date)

   WAREHOUSE (Warehouse#, City)

   Here, Ord_Amt refers to total dollar amount of an order; Odate is the date the order was placed; Ship_date is the date an order is shipped from the warehouse. Assume that an order can be shipped from several warehouses. Specify the foreign keys for the above schema, stating any assumptions you make. Then specify the following queries in relational algebra:

   a. List the Order# and Ship_date for all orders shipped from Warehouse number 'W2'.
   b. List the Warehouse information from which the Customer named 'Jose Lopez' was supplied his orders. Produce a listing: Order#, Warehouse#.
   c. Produce a listing: CUSTNAME, #OFORDERS, AVG_ORDER_AMT, where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.
   d. List the orders that were not shipped within 30 days of ordering.

[illegible] SQL? Discuss each type of join operation with an example. [6]

[illegible] employee database, where the primary keys are underlined. Give an expression [8]
[illegible] of the following queries

[illegible] (employee-name, street, city)
Works (employee-name, company-name, salary)
Company (company-name, city)
Manages (employee-name, manager-name)

a. Find the names of all employees who work for First Bank Corporation.
b. Find the names and cities of residence of all employees who work for First Bank Corporation.
c. Find the names, street addresses, and cities of residence of all employees who work for First Bank Corporation and earn more than $10,000.
d. Find all employees in the database who live in the same cities as the companies for which they work.

5. A. Compute the closure of the set of functional dependencies F = {A → BC, CD → E, B → D, E → A} for relation schema R = (A, B, C, D, E). List the candidate keys for R. [6]

B. Consider the universal relation R = {A, B, C, D, E, F, G, H, I, J} and the set of functional dependencies F = {AB→C, A→DE, B→F, F→GH, D→I}. What is the key for R? Decompose R into 2NF, then 3NF relations. [8]

↳ candidate key

6. A. Discuss the ACID properties of the transaction in detail. [6]

B. Discuss the different measures of transaction equivalence. What is the difference between conflict equivalence and view equivalence? [8]

END