

# International Islamic University Chittagong

## Department of Computer Science and Engineering

B. Sc. in CSE Mid-term Examination, Spring 2024

Course Code: CSE 2423 Course Title: Database Management System

Total marks: 30

Time: 1 hour 30 minutes

[Answer all the questions. Figures in the right-hand margin indicate full marks.]

1. CO DL
- a) Define **Database Management System**. Write about any two of the real-life applications of Database Management System. 2 CO1 R
- b) Describe about relational and object-oriented data model. 3 CO1 U
- c) Explain with example, how database management system resolve the problems of redundancy and atomicity 5 CO2 Ap
- 2.
- a) Consider the following specifications for designing a travel planning platform: 5 CO1 Ap
- Each user should have a unique user ID and associated profile details.
  - Users can create multiple itineraries, each associated with a particular user.
  - Each lists should include various destinations, and destinations may appear in multiple itineraries.
  - Users can review accommodations, transportation, and attractions, each having associated details and ratings.
  - The social component allows users to connect with friends, share itineraries, and view each other's travel experiences.
- Design the **E-R diagram** for the above *problem*. Consider all the necessary mapping cardinalities, attributes and participation constraints. Your database should store information the relationships between users, lists, destinations, reviews, and social interactions and encode the following information.
- b) Construct an ER-Diagram of 3 levels for Vehicles such as Bus, Truck and Rickshaw **using specialization and generalization hierarchy system**. Justify your placement of attributes at each level of the hierarchy. 3 CO1 Ap
- c) Write down the problems of using Cartesian Product. How could it be resolved? Explain with example. 2 CO2 U
- OR**
- Why should we avoid natural join? Explain with example
- 3.
- a) Write names of 2 **aggregate functions** with their syntax in relational algebra. 2 CO1 R
- b) **classroom** (building, room\_number, capacity)  
**department** (dept\_name, building, budget) 8 CO1 Ap  
**course** (course\_id, title, dept\_name, credits)  
**instructor** (ID, name, dept\_name, salary)  
**section** (course\_id, secid, semester, year, building, room number, time slot id)

**teaches** (ID, course\_id, sec\_id, semester, year)

**student** (ID, name, dept\_name, tot\_cred)

**takes** (ID, course\_id, sec\_id, semester, year, grade)

Consider the relational database of a university database management system, where the primary keys are underlined. Write **queries in relational algebra** to answer the following questions -

1. Find the ID, name and salary of each instructor in the Physics department or those having salary greater than \$40,000
2. Find the ID and name of each instructor in a department located in the building 'Watson'
3. Find all the courses taught in the Fall 2023 semester but not in Spring 2024 semester.
4. Find the ID and name of those instructors who earn more than the instructors in the Physics department.

**OR,**

1. Find all instructor whose salary is above average for their department
2. Find all courses taught in both the Fall 2022 semester and in the Spring 2022 semester
3. Find all students who have taken all courses taught by instructor named 'John Doe'
4. List all departments along with number of students in each department.