

International Islamic University Chittagong (IIUC)  
Department of Electronic and Telecommunication Engineering (ETE)  
**Semester End Examination**

**Program:** B.Sc. (Engg)

**Semester:** Spring 2025

**Course Code:** ETE-4757

**Course Title:** Database Management Systems

**Time:** 2 hours 30 minutes

**Full Marks:** 50

(i) Answer all the questions. The figures in the right hand margin indicate full marks.

(ii) Course Outcomes (COs) and Bloom's Level are mentioned in additional Column.

Course Outcomes (COs) of this course	
CO1	Familiarization with the Database system, RDBMS, SQL, Transaction processing, Concurrency control
CO2	Design and Development of a database application system

Bloom's Level of the Questions						
Letter Symbols	R	U	Ap	An	E	C
Meaning	Remember	Understand	Apply	Analysis	Evaluate	Create

**Part A**

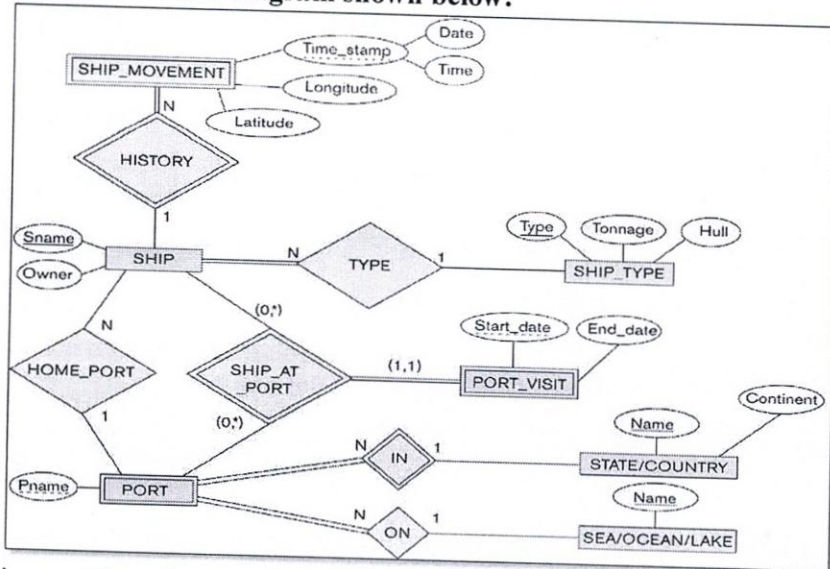
- [1] (a) Why do we need ER diagrams? Explain their importance in database design. U CO2 5
- (b) Analyze the concept of relationships within ER diagrams by comparing binary and ternary relationships. An CO2 5
- [2] Write an SQL function **dept\_count** that takes a department name as input and returns the number of instructors in that department. Using this function, write a query to display the names and budgets of all departments that have more than 12 instructors. An CO1 10

[2]

OR

Consider the ER diagram shown below:

An CO2 10



- Describe why the "PORT\_VISIT" entity is considered a weak entity. Discuss why "Time\_stamp" is considered a composite attribute.
- Define what a ternary relationship is in an ERD. Why is it significant in capturing the interactions between SHIP, PORT, and PORT\_VISIT?

**Part B**

[3] (a)

What is Rapid Application Development (RAD) in the context of web applications, and name two features or tools commonly used in RAD to speed up the development of user interfaces?

C CO2 5

(b)

A single table stores the following information for a university database:

Ap CO2 5

- StudentID
- StudentName
- CourseID
- CourseName
- InstructorName
- 

**Tasks:**

- Identify any problems that could happen if all this data is stored in one table.
- Suggest how to split this table into smaller tables to avoid these problems. Name the new tables and the data each will contain.

- [4] Evaluate the following concepts in the context of object-oriented and object-relational databases: E CO2 10
- i. Explain the benefits and challenges of **inheritance in SQL**.
  - ii. Describe what **multiset types** are and mention one limitation when using them.
  - iii. Define **nesting** and **unnesting** in databases. Give one example of when each is used.
  - iv. Compare these two types of databases.

- [5] (a) Explain the difference between 1NF, 2NF, and 3NF with examples. R CO1 5

- (b) E CO1 5

EmpID	EmpName	Project ID	ProjectName	Hours Worked
1	A	1	Website Design	20
1	A	2	Mobile App Development	10
2	B	1	Website Design	15

You are

given the following table **EmployeeProject**:

Table: **EmployeeProject**

Normalize the table **step-by-step** up to **Third Normal Form (3NF)**, showing the decomposition and resulting tables.

**OR**

- [5] (a) What is the main goal of normalization in database design? R CO1 5

- (b) A university wants to build a Learning Management System (LMS) using an object-relational database. The system includes: E CO1 5
- Person type: a structured type with fields id, name, email.
  - Student and Instructor are subtypes of Person.
  - A Course object includes a courseID, title, a nested multiset of enrolled Students, and a reference to the Instructor.
  - A Student can enroll in multiple courses and has an array of grades.
  - The system requires unnesting of grades for reporting and analytics.

Explain how **multiple type inheritance** would be handled if a user can be both a Student and an Instructor. What challenges might arise in SQL?