# Department of Information Technology II/IV B.Tech <u>REPORT ON INNOVATIVE DELIVERY METHOD</u> Problem based Activity – Group based collaborative activity A.Y.2023-24

Name of the Topic: Entity Relationship Diagram Target Audience: Students of II/IV B.Tech II Semester Date of activity conducted: 16-04-2024 & 18-04-2024 No. of students participated: 140 Name of the Faculty: G.Geetha, Assistant Professor Dr.T.Anuradha, Professor

# **Objective of the activity:**

The objective of a group-based collaborative activity on creating an Entity-Relationship (ER) Diagram

**Understanding Application Requirements:** The primary objective is for students to comprehend the functional requirements of the given application. This involves analysing the application's purpose, user interactions, and data management needs.

**Applying ER Modelling Concepts**: Students should apply their knowledge of ER modelling concepts to translate the application's requirements into an Entity-Relationship (ER) diagram. This includes identifying entities, relationships between entities, attributes, and constraints.

**Collaborative Problem Solving**: The activity aims to foster collaboration among team members. Students work together to brainstorm, discuss, and resolve ambiguities or conflicting requirements. This encourages critical thinking and consensus-building skills.

A group based collaborative activity in Conceptual design using ER modelling was organized for the students of 2nd year B section on 16th April 2024. The Collaboration session engaged students in real-world database challenges. Participants were presented with dynamic initiated scenarios and



discussions to dissect and comprehend the intricacies of each problem. Students collectively represented the scenarios, translating their discussions into visually intuitive ER diagrams on physical sheets. This interactive approach fostered teamwork and critical thinking skills while providing hands-on experience in problem-solving within the realm of database management systems. Overall, the activity facilitated a seamless integration of theoretical knowledge with practical application, enhancing students.



The group-based collaborative activity on drawing an ER diagram was a valuable learning experience. It allowed us to apply theoretical knowledge of ER modelling in a practical context, enhanced our teamwork and problem-solving abilities, and improved our presentation and communication skills. By working together to analyse, design, and present our ER diagrams, students gained a deeper appreciation for the complexities of database design and the importance of effective collaboration in achieving comprehensive and accurate solutions.



List of tasks provided to students on the day of activity: A total of 36 tasks were given to 36 teams. Team size of 3 to 4

#### Task 1:

#### Requirements

The database must store book, author, publisher and warehouse information. For every book you must capture the title, isbn, year and price information. The isbn value is unique for a book. For every author you must store an id, name, address and the URL of their homepage. Each author can write many books, and each book can have many authors, for example.

For every publisher you must store an id, name, address, phone number and an URL of their website.

Books are stored at several warehouses, each of which has a code, address and phone number. A book has only one publisher.

The warehouse stocks many different books. A book may be stocked at multiple warehouses. The database records the number of copies of a book stocked at various warehouses.

Design an ER diagram for such a bookstore. Your ER diagram must show entities, attributes and the relationships between entities.

#### Task 2:

Bank Entity : Attributes of Bank Entity are Bank Name, Code and Address.

Code is Primary Key for Bank Entity.

Customer Entity : Attributes of Customer Entity are Customer\_id, Name, Phone Number and Address. Customer\_id is Primary Key for Customer Entity.

Branch Entity : Attributes of Branch Entity are Branch\_id, Name and Address.

Branch\_id is Primary Key for Branch Entity.

Account Entity : Attributes of Account Entity are Account\_number, Account\_Type and Balance. Account\_number is Primary Key for Account Entity.

Loan Entity : Attributes of Loan Entity are Loan\_id, Loan\_Type and Amount. Loan\_id is Primary Key for Loan Entity.

#### Task 3:

# **COMPANY DATABASE-QUESTION**

- The company is organized into departments. Each department has a unique name, a unique number, and a particular employee who manages the department. We keep track of the start date when that employee began managing the department. A department may have several locations.
- A department controls a number of projects, each of which has a unique name, a unique number, and a single location.
- We store each employee's name, Social Security number,<sup>2</sup> address, salary, sex (gender), and birth date. An employee is assigned to one department, but may work on several projects, which are not necessarily controlled by the same department. We keep track of the current number of hours per week that an employee works on each project. We also keep track of the direct supervisor of each employee (who is another employee).
- We want to keep track of the dependents of each employee for insurance purposes. We keep each dependent's first name, sex, birth date, and relationship to the employee.

# REPRESENT THE ABOVE IN A ER DIAGRAM.

#### Task 4:

You have just been hired as a consultant for a big airplane manufacturer. They want you to completely redesign their database system. Talking with the people in the company, you get the following information.

• The database contains information about employees, factories and parts.

• Each employee has a social security number (SSN), name and salary. An employee is uniquely identified by his/her SSN. Also each employee has address composed of (city, state, and zip code).

Each employee may have at least one duty.

• Each factory has an id, a name and a budget. The id uniquely identifies a factory.

• Each part has an id and a name. The id uniquely identifies a part.

• Each employee reports to at most one other employee.

• Each employee works in at least one factory. And of course a factory has many employees.

• Each part is manufactured in exactly one factory. A lot of different parts can be

manufactured in a factory.

Draw the Entity-Relationship (ER) diagram for the above application

# Task 5:

UPS prides itself on having up-to-date information on the processing and current location of each shipped item. To do this, UPS relies on a company-wide information system.

Shipped items are the heart of the UPS product tracking information system. Shipped items

can be characterized by item number (unique), weight, dimensions, insurance amount, destination, and final delivery date.

Shipped items are received into the UPS system at a single retail center. Retail centers are characterized by their type, uniqueID, and address.

Shipped items make their way to their destination via one or more standard UPS transportation events (i.e., flights, truck deliveries). Each transportation event transports many items. These transportation events are characterized by a unique scheduleNumber, a type (e.g, flight, truck), and a deliveryRoute.

Please create an Entity Relationship diagram that captures this information about the UPS system. Be certain to indicate identifiers and cardinality constraints.

# Task 6:

Assume the following application that keeps track of the authors and their novels. In the design, you need to capture the following:

You

have a set of authors, each author has an ID (unique identifier), name, address composed of (city and state), and number of novels is calculated by the sum of novels.

Each novel has a unique id, name, and price. A novel also can belong to more than one category. Novels are sold by bookstores. Each bookstore has a unique name, manager name and phone number. Each bookstore may have many addresses.

A novel may be sold by one or more bookstore. A bookstore sells a lot of different novels. Each novel has a unique author.

Each author may publish one or more novels. Publication has a publisher and a publication year.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design. Make sure cardinalities and primary keys are clear.

# Task 7:

Draw a normal form ER diagram for a university library information system which stores information about books, journals, publishers, students, staff, borrowing of books, and reservation of books. Note that the library may have more than one copy for some of the books.

#### Task 8:

Consider the following set of requirements for a Bank database that is used to keep track of Customer.

Each bank has a unique name.

Each branch has a number, name, address (number, street, city), and set of phones.

Customer includes their name, set of address (P.O. Box, city, zip code, country), set of phones, and social security number.

Accounts have numbers, types (e.g. saving, checking) and balance. Other branches might use the same designation for accounts. So to name an account uniquely, you need to give both the branch number to which this account belongs to and the account number.

Not all bank customers must own accounts and a customer may have at most 5 accounts in the bank.

An account must have only one customer.

A customer may have many accounts in different branches.

#### Task 9:

A General Hospital consists of a number of specialized wards (such as Radiology, Oncology, etc) .Information about ward includes unique name, total numbers of current patients. Each ward hosts a number of patients, who were admitted by a consultant (doctors) employed by the Hospital. On admission, the date and time are kept. The personal details of every patient includes name, Medical Recode Number (MRN), set of phone and one address (city, street, code). A separate register is to be held to store the information of the tests undertaken. Each test has unique episode No. , category and the final result of test. Number of tests may be conducted for each patient. Doctors are specialists in a specific ward and may be leading consultants for a number of patients. Each patient is assigned to one leading consultant but may be examined by other doctors, if required.

#### Task 10:

The following schema diagram illustrates all the relations in the database. Each relation has primary keys underlined. Based on the class diagram below draw the ER Diagram and show the necessary parameters



# Task 11:

1: Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):

The NHL has many teams,

Each team has a name, a city, a coach, a captain, and a set of players,

Each player belongs to only one team,

Each player has a name, a position (such as left wing or goalie), a skill level, and A set of injury records,

A team captain is also a player,

A game is played between two teams (referred to as host\_team and guest\_team) and has a date (such as May 11th, 1999) and a score (such as 4 to 2). Construct a clean and concise ER diagram for the NHL database.

# Task 12:

2: A university registrar's office maintains data about the following entities:

1. Courses, including number, title, credits, syllabus, and prerequisites;

2. Course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom;

3. Students, including student-id, name, and program;

4. Instructors, including identification number, name, department, and title.

Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the mapping constraints.

# Task 13:

Construct an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. Car insurance tables:

person (driver-id, name, address) car (license, year,model) accident (report-number, date, location) participated(driver-id, license, report-number, damage-amount)

### Task 14:

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.

Patient(SS#, name, insurance) Physician ( name, specialization) Test-log( SS#, test-name, date, time) Doctor-patient (physician-name, SS#) Patient-history(SS#, test-name, date)

#### Task 15:

A relational database is used by a travel agency to store details of Scottish holiday resorts and hotels in each resort. Construct an ER Diagram by showing the below entities, attributes and keys are shown in the tables below:

Entity: Resort	Entity: Hotel	Entity:	Entity: Booking
		Customer	
resortID	<u>hotelRef</u>	<u>customerNo</u>	bookingNo
resortName	hotelName	firstname	customerNo*
resortType	resortID*	surname	hotelRef*
trainStation	starRating	address	startDate
	seasonStartDate	town	numberNights
	swimmingPool	postcode	numberInParty
	mealPlan		
	checkInTime		
	pricePersonNight		

#### Task 16:

Assume you have the following application that models soccer teams, the games they play, and the players in each team. In the design, you need to capture the following:

• You have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.

• Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.

• Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.

• For each match you need to keep track of the following:

The date on which the game is played

The final result of the match

The players participated in the match. For each player, how many goals he scored,

whether or not he took yellow card, and whether or not he took red card.

During the match, one player may substitute another player. Capture this substitution and the time at which it took place.

• Each match has exactly three referees. For each referee you have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design (use the back of the page if needed). Make sure cardinalities and primary keys are clear.

# Task 17:

Draw the ER diagram for the following Shcema Doctor(SSN, FirstName, LastName, Specialty, YearsOfExperience, PhoneNum) Patient(SSN, FirstName, LastName, Address, DOB, PrimaryDoctor\_SSN) Medicine(TradeName, UnitPrice, GenericFlag) Prescription(Id, Date, Doctor\_SSN, Patient\_SSN) Prescription\_Medicine(Prescription Id, TradeName, NumOfUnits)

# Team 18:

Draw an ER Diagram for Library Management System with the following data Book Entity: It has author, book\_ID, title, price, and availability. Publisher Entity: It has publisher\_ID, publisher\_address, and publisher\_name. Member Entity: It has member\_ID, member\_date, member\_type, member\_address, member name, and expiry date.

# **Execution Plan:**

# Time management: Class time: 50 mins

- Dissemination of problem statements : 10 mins
- Discussion on steps of LP model given within the group : 10 mins
- Problem solving : 10 mins
- Representation on Charts by the students : 15 mins
- Course coordinator summary : 5 mins

# **Expected Outcomes:**

The outcomes of the group-based collaborative activity on drawing an Entity-Relationship (ER) diagram for a given application can be summarized as follows:

Participants gained a deeper understanding of ER modelling concepts, including entities, relationships, attributes, and constraints.

The activity promoted collaboration and teamwork among participants. By working together to brainstorm ideas, make decisions, and finalize the ER diagram, students learned to leverage each other's strengths, communicate effectively, and resolve disagreements constructively.

Team No	Teams	Assessment before activity(Taken Ass2)	Assessment after activity(Taken Sess2)	Improvement
	228W1A1292	10	15	$\checkmark$
1	228W1A12B4	9.5	12.5	$\checkmark$
	228W1A1276	8	12.5	$\checkmark$
	228W1A12A1	5	13	$\checkmark$
	228W1A12B8	8.5	13.5	
2	228W1A12C5	7.5	11.5	$\checkmark$
	228W1A1293	7	10.5	
	228W1A1277	5.5	10.5	$\checkmark$
	228W1A1273	5.5	7	
3	228W1A12A2	6	9	
	228W1A1295	9	13	✓
	228W1A12C9	9	12	
	228W1A1296	7	10.5	
4	228W1A12D0	7.5	14.5	$\checkmark$
	228W1A12C3	6	10.5	~
	228W1A1282	7	15	~

Assessment of the effectiveness of the activity

5	228W1A1280	10	15	$\checkmark$
	228W1A1283	7	13.5	$\checkmark$
	228W1A1274	8	15	$\checkmark$
	228W1A1281	8	12	$\checkmark$
	228W1A12C4	9.5	9.5	
	228W1A1298	8	14.5	$\checkmark$
0	228W1A1288	7	9.5	$\checkmark$
	228W1A1272	9	15	$\checkmark$
	228W1A12C0	7	15	$\checkmark$
7	228W1A12A6	10	14.5	
/	228W1A1289	7	12	$\checkmark$
	228W1A1285	10	13.5	$\checkmark$
	228W1A1297	7	15	$\checkmark$
8	228W1A12B5	6.5	7.5	
	228W1A1294	7	12	
	228W1A12C8	10	14.5	$\checkmark$
	228W1A12A7	8	12.5	$\checkmark$
9	228W1A12A3	9	13	$\checkmark$
	228W1A1286	10	11.5	
	228W1A1287	9.5	15	$\checkmark$
	228W1A1275	10	15	$\checkmark$
10	228W1A12A9	8	14	$\checkmark$
10	228W1A1279	7	12	
	228W1A1271	6	14	$\checkmark$
	228W1A12B0	8	15	$\checkmark$
11	228W1A1278	А	11	$\checkmark$
11	228W1A1284	7.5	15	$\checkmark$
	228W1A1291	7	12.5	$\checkmark$
	228W1A12C2	8	14	$\checkmark$
12	228W1A12A0	10	15	$\checkmark$
	228W1A1290	8.5	14.5	$\checkmark$
	228W1A12B7	6	8.5	$\checkmark$
	228W1A1269	8	12.5	
13	228W1A1268	6.5	15	$\checkmark$
	228W1A1270	8	15	$\checkmark$

	228W1A1267	5	14	~
14	228W1A1266	3	8.5	~
	228W1A12B6	9	10.5	
	228W1A12C7	8.5	14.5	~
	228W1A12C1	7.5	9.5	
	238W5A1208	9	15	$\checkmark$
15	238W5A1213	7	13	$\checkmark$
15	238W5A1209	8	9.5	
	238W5A1212	9.5	15	$\checkmark$
16	238W5A1215	7.5	15	$\checkmark$
	238W5A1214	9	15	~
	238W5A1211	7	13	$\checkmark$
	238W5A1210	8	9.5	
	228W1A12A4	9.5	15	$\checkmark$
17	228W1A12A8	7.5	15	$\checkmark$
	228W1A12B2	7	13	$\checkmark$
18	228W1A12A5	8	9.5	✓
	228W1A12B9	9.5	15	✓
	228W1A12C6	7.5	15	✓

The group-based activity on ER Diagram, conducted with teams of four students each, resulted in a significant improvement for 90% of the participants. Through collaborative engagement, students deepened their understanding of database design principles and applied ER modeling concepts effectively. The activity fostered teamwork, critical thinking, and problem-solving skills, preparing students for real-world applications in database management. Participants highlighted increased confidence in designing ER diagrams and a clearer grasp of relational database concepts, reflecting the success and impact of the event on their learning outcomes.

Student Performance	No.of Students attended	Percentage of Change	Analysis of Improvement
Improvement	53	77.14%	50
No Change	17	24%	No.of Students attendedPercentage of ChangeImprovement5377.14%No Change1724%