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| **Course Name:** | **Database Management System Laboratory** | **Semester:** | **IV** |
| **Date of Performance:** | **11 / 01 / 2023** | **Batch No:** | **A – 3** |
| **Faculty Name:** | **Prof. Shila Dhande** | **Roll No.:** | **16014022050** |
| **Faculty Sign & Date:** |  | **Grade / Marks:** | **\_\_\_ / 25** |

**Experiment No.: 1**

**Title: Entity-Relationship Diagram**

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| **Aim and Objective of the Experiment:** |
| **Aim:** Problem Definition and Design of Entity-Relationship diagram  **Objective:** To define a Database Problem and Design an ER diagram for a business domain. |

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| **COs to be achieved:** |
| **CO1:** Design entity-relationship diagrams to represent different database application scenarios. |

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| **Books / Journals / Websites Referred:** |
| 1. G. K. Gupta:” Database Management Systems”, McGraw – Hill 2. Korth, Slberchatz, Sudarshan: “Database Systems Concept”, 6th Edition, McGraw Hill 3. Elmasri and Navathe, “Fundamentals of Database Systems”, 5th Edition, PEARSON Education. |

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| **Tools Required:** |
| * Dia Software - A software to Design ER Model   Dia is one of the convenient open-source tools which runs on multiple platforms including Linux, Windows and MacOS. Dia has a number of "sheets" each of which includes diagram objects for different modeling tools, such as UML, ER diagrams, flowcharts, etc. |

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| **Theory:** |
| The ER tool has objects for entities, relationships, attributes (using the oval notation), edges, and so on. The properties boxes for each of these elements allow you to specify cardinality constraints, total participation, identifying relationship, etc.  It supports many common formats to store diagrams such as jpeg, png, eps, etc.  **Pre Lab/ Prior Concepts:**  The ER data model was developed to facilitate the database design by allowing specification of an enterprise schema that represents the overall logical structure of the database. The ER model is one of the several data models. The semantic aspect of the model lies in its representation of the meaning of the data. The ER model is very useful many database design tools drawn on concepts from the ER model. The ER model employs 3 basic notations: entity set, relationship set and attributes. |

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| **Implementation Details:** |
| **Procedure for doing the ER diagram experiment:**   1. Identifying the Entities (strong and weak entities). 2. Identify attributes of the Entity (keys, partial key, simple, composite, multivalued, derived). 3. Identify relationship (recursive). 4. Identify the structural constraints of the relationship (cardinality ratio, participation constraints).   **ER- Diagram for company Case Study Database:**  Basic ER Diagram of a COMPANY Database | Download Scientific Diagram |

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| **Problem Statement and E-R Diagram:** |
| **Problem Statement for Hotel Management System:**  Hotel Management System is a hotel reservation site script where site users will be able to search rooms availability with an online booking reservations system. Site users can also browse hotels, view room inventory, check availability, and book reservations in real-time. Site users enter check in date and check out date then search for availability and rates. After choosing the right room in the wanted hotel All booking and reservation process is done on the site and an SMS is sent to confirm the booking.  **Hotel Management System Entities and Attributes –**  Hotel Entity: Attributes of Hotel are:   * hotel\_pin * hotel\_name * hotel\_address * hotel\_description * hotel\_rent   Rooms Entity: Attributes of rooms are:   * room\_id * room\_no * room\_type   Services Entity: Attributes of Services are:   * service\_id * service\_name * service\_type * service\_description   Payments Entity: Attributes of Payments are:   * payment\_amount * payment\_id   Booking Entry: Attributes of Booking are:   * booking\_id * booking\_start\_date * booking\_end\_date   Customers Entity: Attributes of Customers are:   * customer\_id * customer\_name * customer\_mobile\_no * customer\_email * customer\_address   **Relationships Between –**   * Hotel and Rooms * Hotel and Booking * Hotel and Customer * Hotel and Payments * Customer and Rooms * Customer and Login * Customer and Services * Customer and Payments * Customer and Booking * Rooms and Services   **E-R Diagram for Hotel Management System:** |

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| **Post Lab Subjective / Objective Type Questions:** |
| 1. **In the Academic database a Grade is issued to each STUDENT for each COURSE taken and stored in the STUDENT COURSE DETAIL entity. A STUDENT may decide to re-take a COURSE to better their GRADE. The administration would like to keep a record of the old/previous Grade as well as the new Grade. Show ER diagram to include historical Grades if the students should have them.**      1. **Discuss the concept of aggregation. Give an example. How to represent aggregation in ER model.**   An ER diagram is not capable of representing the relationship between an entity and a relationship which may be required in some scenarios. In those cases, a relationship with its corresponding entities is aggregated into a higher-level entity. Aggregation is an abstraction through which we can represent relationships as higher-level entity sets.  For Example, an Employee working on a project may require some machinery. So, REQUIRE relationship is needed between the relationship WORKS\_FOR and entity MACHINERY. Using aggregation, WORKS\_FOR relationship with its entities EMPLOYEE and PROJECT is aggregated into a single entity and relationship REQUIRE is created between the aggregated entity and MACHINERY.     1. **Two separate banks which decide to merge. Both banks use same ER database schema (Assume the ER diagram). If the merged bank is to have a single database, there are several potential problems:**  * **The possibility that two original banks have branches with the same name.** * **The possibility that some customers are customers of both original banks.** * **The possibility that some loan or account numbers were used at both original banks.**   **Discuss for each of these potential problems, why there is indeed potential difficulty in database based on ER model. Propose a solution to a problem. For your solution, explain any changes that would have to be made and describe what their effect would be on the ER database schema and the data.**   1. **Branches with the Same Name:**   Potential Difficulty:  If both banks have branches with the same name, there would be a naming conflict when integrating the two databases. In an ER model, branch names might be used as identifiers or as part of relationships. If the same branch name exists in both databases, it becomes ambiguous which branch a particular record refers to.  Solution:   * Unique Identification\*\*: Each branch should have a unique identifier (e.g., BranchID) regardless of its name. This identifier can be an auto-incremented number or a combination of location and some unique code. * Normalization: If branch names are used in relationships or as primary keys in tables, consider normalizing the schema by removing them as primary identifiers and replacing them with unique identifiers.   Effect on ER Database Schema:  Add a unique identifier (e.g., BranchID) to the branch entity/table.Update relationships to use this identifier instead of branch names, ensuring clarity and avoiding ambiguity.   1. **Customers of Both Original Banks:**   Potential Difficulty:  If a customer is associated with both banks, merging the databases would lead to duplicate customer entries or conflicts in data integrity. This can lead to issues like double-counting, inconsistency in customer details, or conflicts in related data.  Solution:   * Customer Consolidation: Identify duplicate customer records based on unique identifiers (e.g., CustomerID) and consolidate them into a single record. * Data Mapping: Maintain a mapping table that links customers from both banks to a unified customer ID in the merged database.   Effect on ER Database Schema:   * Create a mapping table or mechanism to link duplicate customer records to a single unified customer ID. * Ensure that all relationships or references to customer data are updated to use this unified ID.  1. **Duplicate Loan or Account Numbers:**   Potential Difficulty:  If loan or account numbers overlap between the two banks, merging the databases could lead to conflicts in identifying unique loans or accounts. This can cause confusion in tracking, servicing, or managing these financial products.  Solution:   * Unique Numbering Scheme: Implement a unique numbering scheme for loans and accounts across the merged entity. This might involve prefixing numbers with bank-specific codes or using a centralized numbering system. * Renumbering or Mapping: Identify overlapping numbers and renumber them or create mapping tables to ensure uniqueness across the merged database.   Effect on ER Database Schema:   * Update the loan and account tables/entities to incorporate a new unique numbering scheme or reference system. * Ensure that all related tables or entities that reference loans or accounts are updated to use the new unique identifiers. |

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| **Conclusion:** |
| In this experiment, we aimed to define a database problem and design an Entity-Relationship diagram using Dia software. By following a structured procedure and drawing on relevant theoretical concepts from database management, the experiment successfully achieved its objective of modeling database applications. |

**Signature of faculty in-charge with Date:**