NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Balkumari, Lalitpur

Affiliated to Pokhara University

ASSIGNMENT FOR DATABASE MANAGEMENT SYSTEM

ASSIGNMENT 2

Submitted by:

Name: Arpan Adhikari

Roll No.: 231309

BE-CE (3rd SEM)

Submitted to:

Er. Simanta Kasaju

Name : Arpan Adhikari
Roll No. : 231309
BE Comp. (Day)

Assignment 2

Q1) Explain the DBMS characteristics approach.

→

The DBMS characteristics approach highlights the key features that define how a DataBase Management system operates :

(i) Data Abstraction
Hides storage complexity with physical, logical and view levels.

(ii) Data Independence
Changes in schema don't affect applications (logical/physical).

(iii) Data Integrity
Ensures accurate and consistent data with constraints.

(iv) Data Security
Manages access through authentication and authorization.

(v) Concurrency control
Supports multiple users while maintaining consistency.

(vi) Transaction Management
Enforces ACID properties for reliable transactions.

Date :
Page

These features makes DBMS efficient, secure and user friendly for data management.

Q2) Explain the different kinds of DB users.

→

Database users are individuals or applications that interact with a Database Management system (DBMS) to perform various tasks. They can be categorized into the following types based on their roles and activities:

(i) Database Administrators (DBAs):
Manage and maintain the database system (e.g. backups, security, tuning).

(ii) Database Designers
Design the database structure and define schemas.

(iii) Application Programmers
Develop applications to interact with database

(iv) End Users
- Casual Users : Perform occasional, ad hoc queries
- Naive Users : Use pre-designed applications (e.g. ATMs)
- Sophisticated Users : Execute complex queries and analyses.

(v) System Analysis
Define system requirements and align them with user needs.

Date: .....
Page: .....

(vi) Testers
Verify database performance, security and functionality

Q3) Difference between database users and DBA.
→

Aspect	Database Users	Database Administrator
Role	Use the database to perform tasks or queries.	Manages and maintains the entire database system.
Focus	Focus on data access and usage.	Focus on system performance, security and integrity
Responsibilities	Querying, updating and retrieving data	schema design, backups, recovery and user management
Access Level	Limited to assigned permissions	Full control over the database system.
Skill Requirement	Basic to advanced querying or analysis.	In-depth knowledge of DBMS, security and administration tools
Examples	End users, application programmers, analysis	IT professionals specializing in database management.

Q4) Differences between DDL, DML and DCL languages.

Aspect	DDL	DML	DCL
Purpose	Defines & modifies database structure	Manipulates data within database tables.	controls user access & permissions
Examples	CREATE, ALTER, DROP, TRUNCATE	SELECT, INSERT, UPDATE, DELETE	GRANT, REVOKE
Impact	Affects the schema or structure of the database.	Affects the actual data stored in the database.	Affects access rights and security
Persistence	changes are permanent and cannot be rolled back.	changes can often be rolled back with transactions.	changes are permanent once executed.
Execution	Defines or removes objects like tables, indexes or views.	Retrieves, adds, updates, or deletes data rows.	Assigned or revokes privilege to users.

Q5) Explain 4 different kinds of data models and also list out the merits and demerits of the Data model. Also, mention the differences between Hierarchial; ER model, and relational models (any 5).

Date :
Page :

Four different kinds of data models :

(i) Hierarchial Data Model
- Organizes data in a tree like structure with a parent-child relationship.
- Examples : File systems, legacy banking systems.

Merits :
- simple and easy to navigate.
- Ensures data integrity through parent-child hierarchy
- Fast data retrieval for structured data.

Demerits :
- Difficult to modify or add new relationships.
- Redundancy due to duplication of parent data.

(ii) Network Data Model
Represents data as a graph with multiple parent-child relationships.
Example : Inventory systems, transport routes.

Merits :
- Handles complex relationships well.
- Allows multiple parent relationships.

Demerits :
- complex structure and makes it harder to design and maintain.
- Requires specialized knowledge.

Date :
Page :

(iii) Relational Data Model

Organizes data into tables (relations) with rows & columns.
Example : Modern database system like MySQL, oracle

Merits :
- simple and flexible ; widely used.
- Easy to query with SQL
- Normalization reduces redundancy

Demerits :
- Performance issues with large datasets.
- Doesnot handle hierarchial or network relationships naturally.

(iv) Entity-Relationship (ER) model

Represents data through entities (objects) and their relationships.
Example : system design, database modeling

Merits :
- clear and visual representation of data.
- Useful for database design and planning.

Demerits :
- Needs conversion to relational or other models for implementation.
- Limited for real time applications.

Differences :

Date: .....
Page: .....

Aspect	Hierarchial Model	ER Model	Relational Model
structure	Tree-like structure with parent-child hierarchy	Graph-like structure with entities and relationships.	Tabular structure with rows and columns
Relationships	One-to-many only	one-to-one, one-to-many, many-to-many	Many-to-many through foreign keys
Flexibility	Rigid structure; difficult to modify	Flexible, but requires transformation for implementation.	Highly flexible for queries and modifications.
Ease of Use	Easy to navigate but hard to design complex relationships	clear visualization but complex to implement.	Intuitive and user-friendly
Query Language	No standard query language.	Not queryable directly; used for design.	SQL for querying and managing data.

Q6) Differentiate between strong and weak entities (any 6)

→

P.T.O.

Date :
Page :

Aspect	Strong Entity	Weak Entity
Definition	An entity that can exist independently and has a primary key.	An entity that depends on a strong entity for its existence.
Primary Key	Has a primary key uniquely identifying each record.	Doesnot have a primary key; relies on a foreign key and partial key
Dependency	Independent of other entities.	Always dependent on a strong entity for identification.
Key composition	Primary key consists of its own attributes.	Primary key is a combination of a foreign key, and its partial key.
Relationship	Usually participates in simple relationship.	Always linked to a strong entity through a 'total participation' relationship.
Notation in ER diagram	Represented by a rectangle.	Represented by a rectangle with a double border.
Example	Strong Entity : Employee (with EmpID as the primary key).	Weak Entity : Dependent (with DepID as partial key, relying on EmpID).

Date :
Page :

Q7) Differentiate between Generalization and specialization (any 5).

→

Aspect	Generalization	specialization
Definition	Combines multiple entities into a single, generalized entity.	Divides a single entity into multiple, specialized entities.
Direction	Bottom-up approach.	Top-down approach
Purpose	Reduces redundancy by grouping common attributes or relationships.	Adds specificity by defining additional attributes or relationships.
Focus	Focuses on identifying commonalities among entities.	Focuses on creating sub-entities based on distinct features.
Examples	Employees and students generalized into a "Person" entity.	A "Person" entity specialized into "Employee" and "Student".

Q8) Explain ER design issues. What are the Uses of ERD?

→

ER design plays a crucial role in structuring databases, but several issues need to be addressed for an effective design:

Date :
Page :

1. Entity definition
Identifying meaningful entities to avoid unnecessary complexity.

2. Attribute Definition
Choosing appropriate attributes and their types (simple, composite, derived).

3. Relationships
Defining correct relationships (one-to-one, one-to-many, many-to-many)

4. constraints
Ensuring accurate cardinality and participation constraints.

5. Normalization
Balancing data integrity and performance by avoiding over or under-normalization.

6. Weak Entities
Correctly managing weak entities and their dependencies on strong entities.

Uses of ERD:

1. Database Design
Maps the logical structure of the database.

Date: _____
Page: _____

2. communication : Helps stakeholders understand system design.
3. Documentation : Serve as a reference for future modifications.
4. Redundancy Check : Identifies and removes redundant data.
5. Maintenance : Aids in maintaining and upgrading the database.

Q9) Differentiate between primary, foreign and candidate keys with examples.

→

Aspect	Primary Key	Foreign Key	Candidate Key
Definition	A unique identifier for each record in a table.	A key in one table that reference as the primary key of another table.	A set of attributes that can uniquely identify a record.
Uniqueness	Always unique for each record.	May or may not be unique in the referencing table.	All candidate keys are unique.
Null values	Cannot contain NULL.	Can contain NULL if not a part of the relationship.	Can contain NULL if not chosen as the primary key.
Purpose	Uniquely identifies records within tables.	Establishes relationships beth tables.	Serves as a potential primary key.
Number Allowed	Only one primary key per table.	Can have multiple foreign keys referencing diff. tables.	Can have multiple candidate keys per table.
Example	Student ID in the Students table	ClassID in the students table referencing classID in classes table	Student ID, Email in the Students table

Date:
Page:

Q10) Draw an ER diagram for Hospital Management system. Starting with login page. Login has users, roles and permission. A user can manage ------

→

Entities and Attributes:

1. ~~Login~~ 1. Login : LoginID (PK), Username, Password
2. Users : UserID (PK), Name, Email
3. Roles : RoleID (PK), RoleName
4. Permission : PermissionID (PK), PName
5. Doctors : DoctorID (PK), DName, speciality, status
6. Nurses : NurseID (PK), Department
7. Hospital : HospitalID (PK), Address, Phone
8. Patient : PatientID (PK), Name, Address, ~~RoomID (FK), BillID (FK)~~
9. Medicines : MedicineID (PK), MName
10. Bill : BillID (PK), Amount
11. Room : RoomID (PK), Floor

Relationships & cardinality :-

1. A login ~~belongs~~ associated to one user.
2. Each user is assigned to one role.
3. 1 User manages many hospital employees.
4. many Doctor is a hospital employee.
5. many Nurse is a hospital employee.
6. many Hospital employee work in a hospital.
7. 1 Doctor treat many patients.
8. 1 Patient is assigned 1 room.
9. 1 Patient uses many medicines.
10. ~~Many Nurses~~ 1 Room is guarded by many nurses.
11. 1 Patient pays many bills.

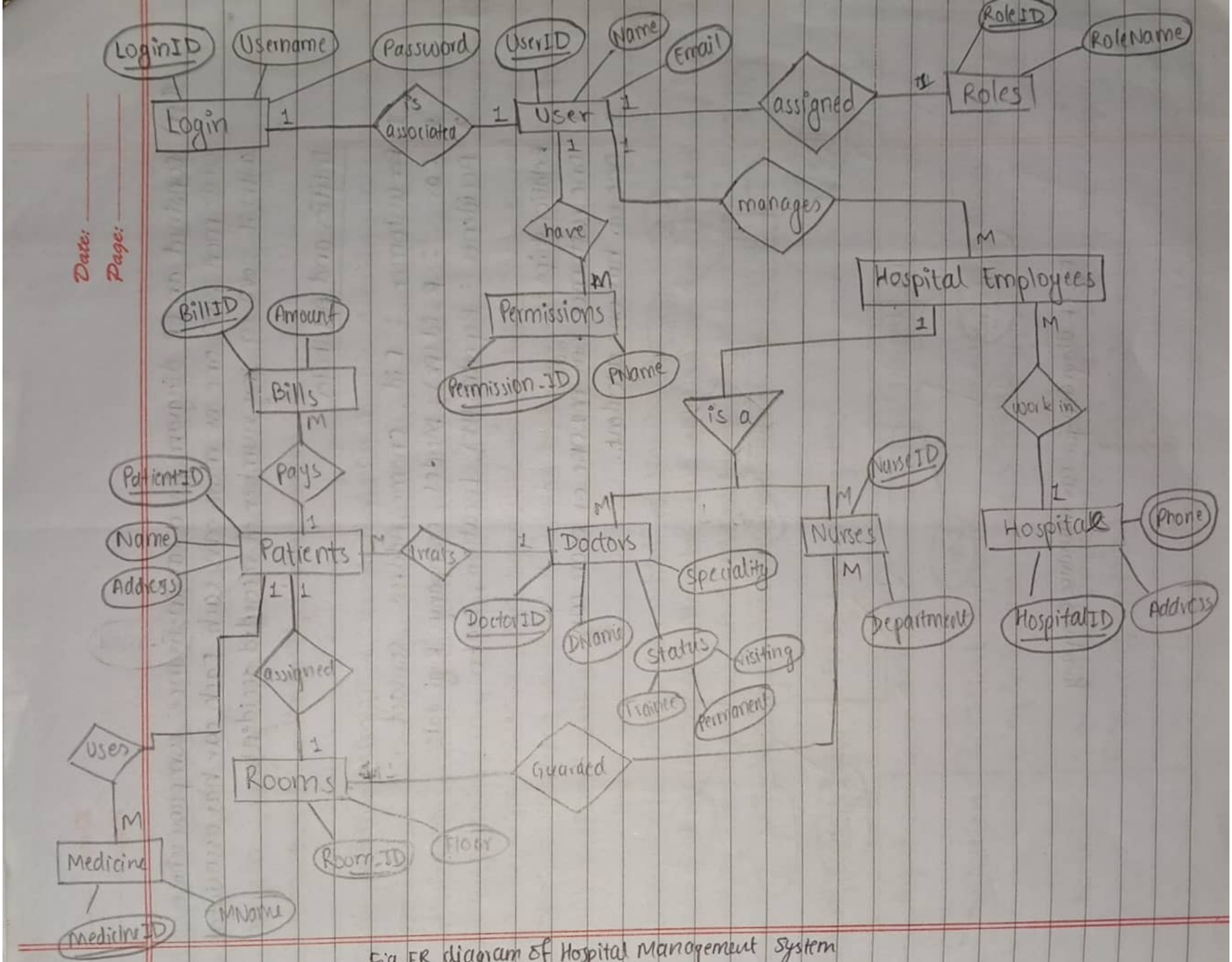


Fig. ER diagram of Hospital Management System

Date:
Page:

Q11) Construct an ER 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.

→

Entities and Attributes:

1. ~~Per~~ Customer : Cid, Cname, Address, Contact
2. Car : R-id (PK), Model, company, Regi-date
3. Accidents : Reportno (PK), Location, Date

Relationships:

1. One customer ~~has~~ owns ~~one~~ one or more cars.
2. One car has one accident.

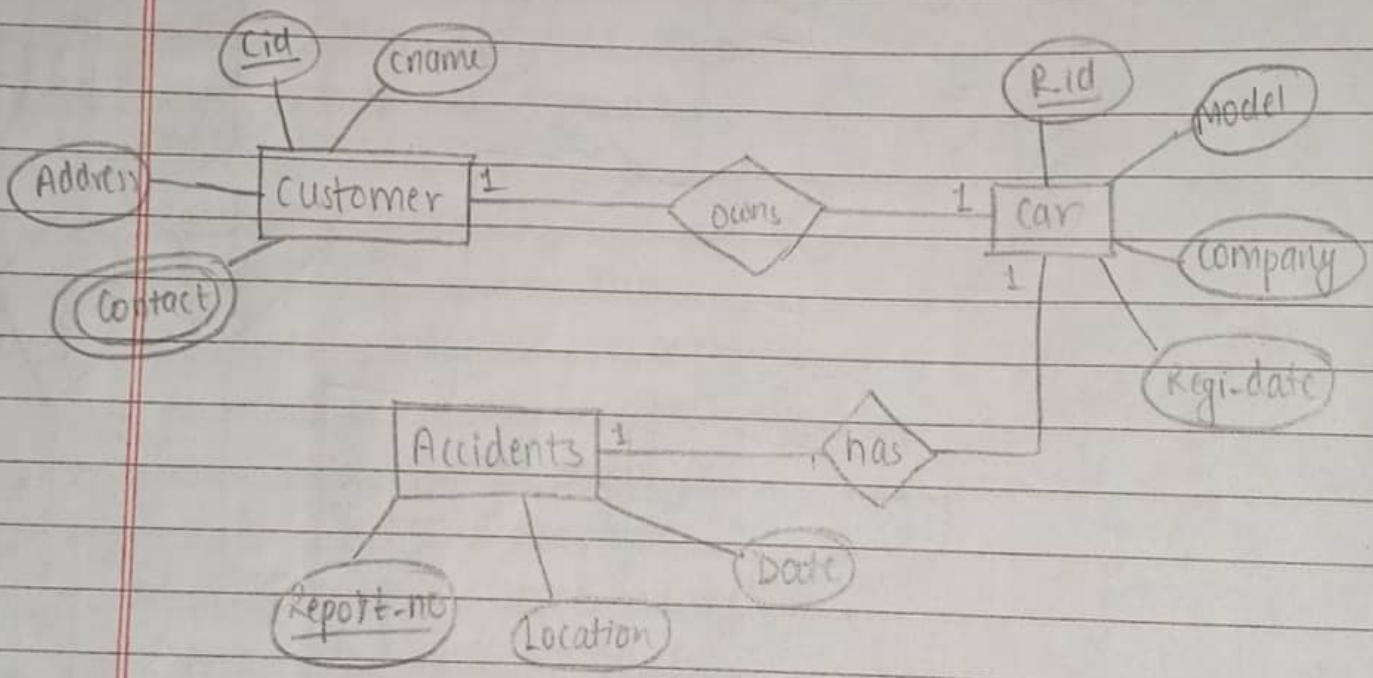


Fig. ER diagram for car insurance company

Date: _____

Page: _____

Q12) How Aggregation and Inheritance helps in ERD?

→

In ERDs, Aggregation and Inheritance are concepts that help represent more complex relationships between entities.

Aggregation simplifies complex relationships by treating a group of entities as a single, higher level entity. It helps manage "whole-part" relationships, where one entity is composed of multiple others. This reduces redundancy and makes the diagram easier to read. For example, a "Department" entity can aggregate entities like "Employee" and "Project", allowing these relationships to be represented at a higher level, rather than individually.

Inheritance models hierarchial relationships by allowing one entity (the subclass) to inherit attributes and relationships from another entity (the superclass). This is useful for representing "is-a" relationships, where multiple entities share common characteristics.

Q13) Differences between Entity and Entity sets.

Aspect	Entity	Entity set
Definition	A distinct object or thing in the real world.	A collection of entities of the same type.
Nature	Represents a single instance of an object.	Represents a group or category of similar entities.

Date:
Page:

Attributes	Has specific attribute values unique to that instance.	shares common attributes among all entities in the set.
Uniqueness	Uniquely identifiable within an entity set.	Comprises multiple entities, each uniquely identifiable
Example	"John Doe"	"All employees" "All cars in a showroom"
Usage	Used to represent data for a specific instance.	Used to define and organize groups of similar entities.

Q14) Construct an ER 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.

↳ ~~Same as 10.~~

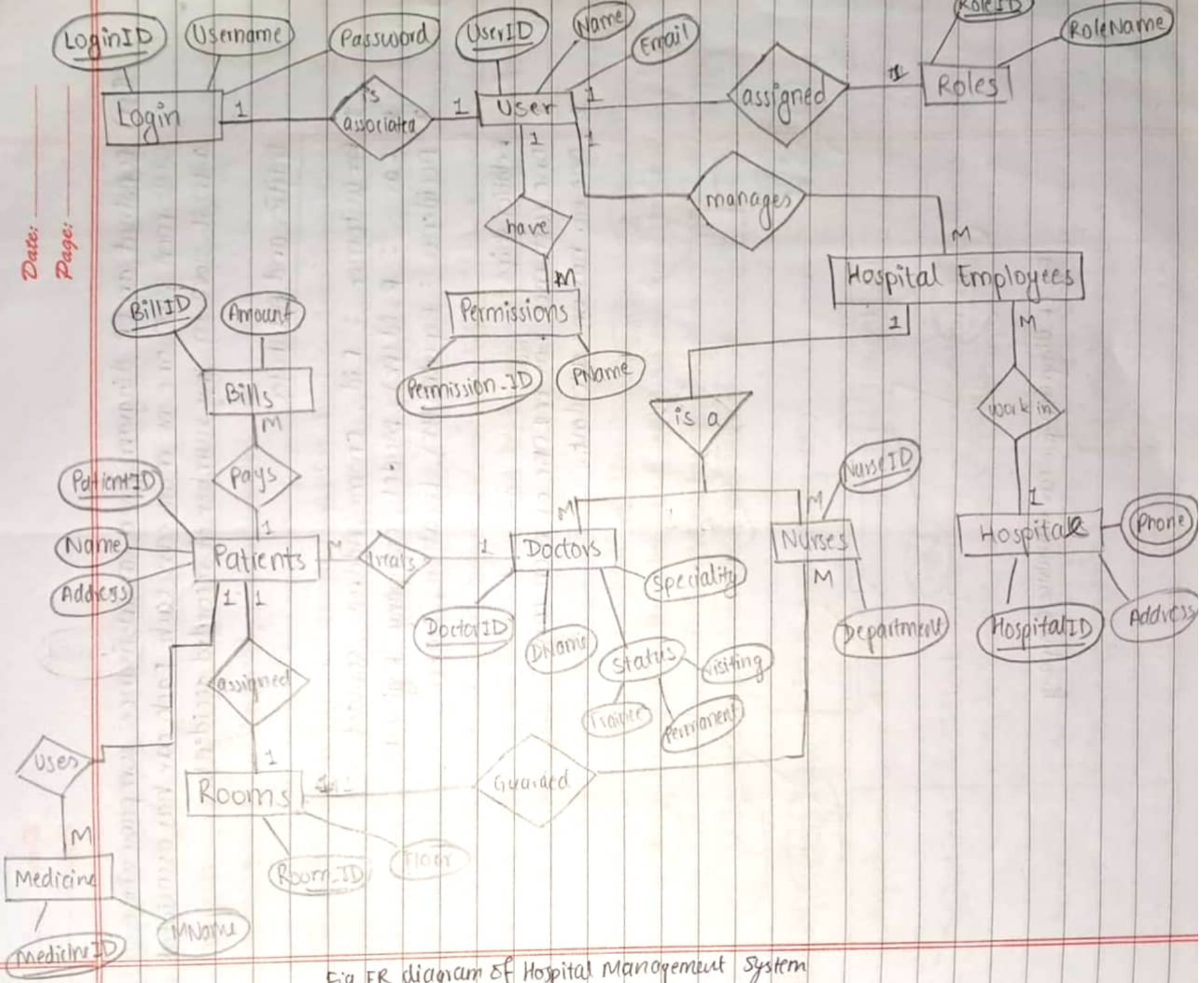


Fig. ER diagram of Hospital Management System

Date:
Page:

Q15) Design an ER diagram for keeping track of the exploits of your favourite sports team. You should store the matches played, the scores in each match, the players in each match, and individual player statistics for each match. summary statistics should be modeled as derived attributes.

→

Entities and Attribute:

1. Team : Tid (PK), Tname, Coach
2. Match : Mid (PK), Date, Opponent, Location
3. Player : Pid (PK), Name, position, T-id (FK)
4. Player_stat : statID (PK), M.id (FK), Pid (FK), Goals, Assists, Minutes

Relationships:

1. A team can play multiple matches.
2. Multiple players participate in a match.
3. A player has stat recorded for each match they play in.

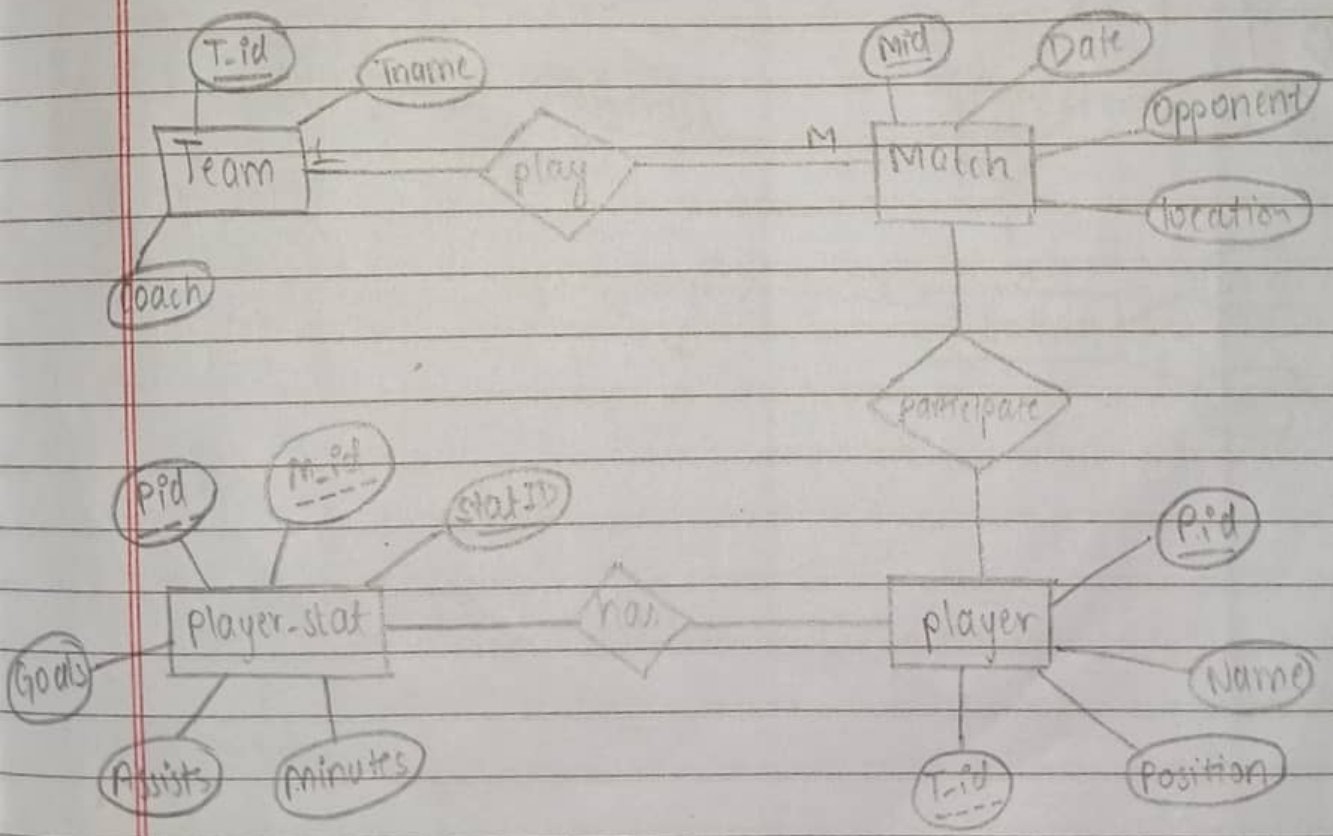
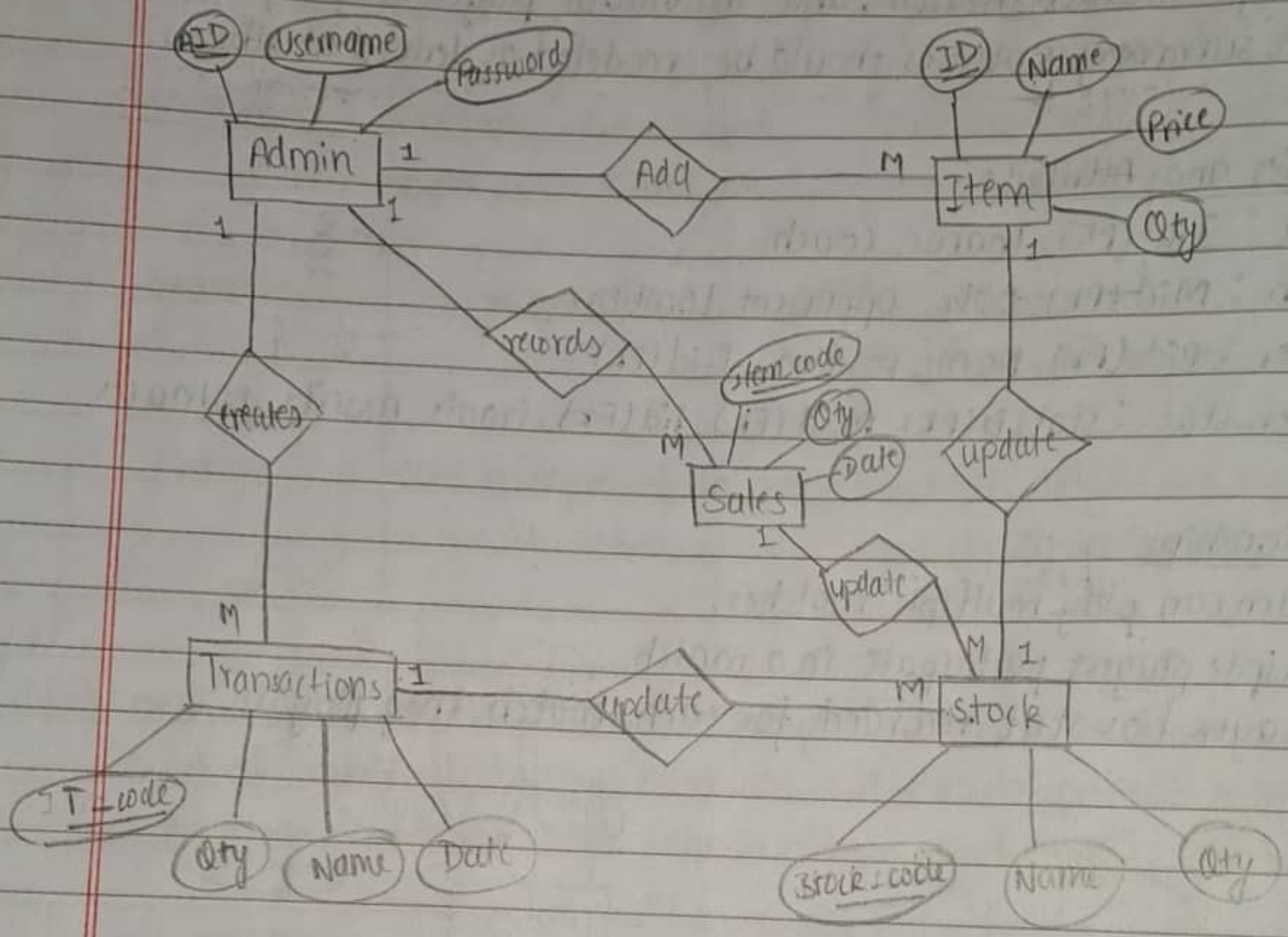


Fig. ER diagram for sports team

Date:
Page:

Q1) Draw ERD for following.

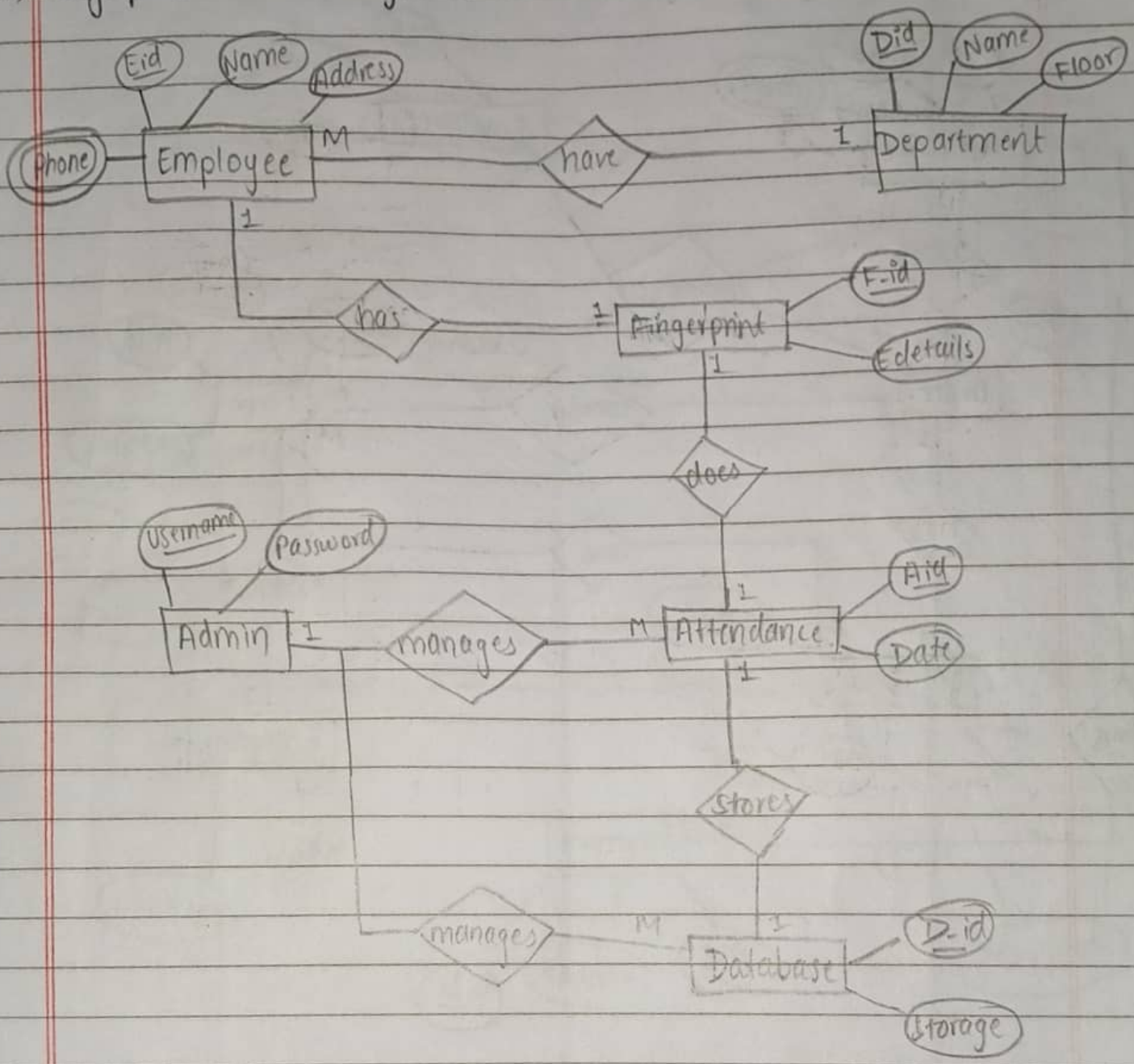
a) Inventory Management system



Date: _____

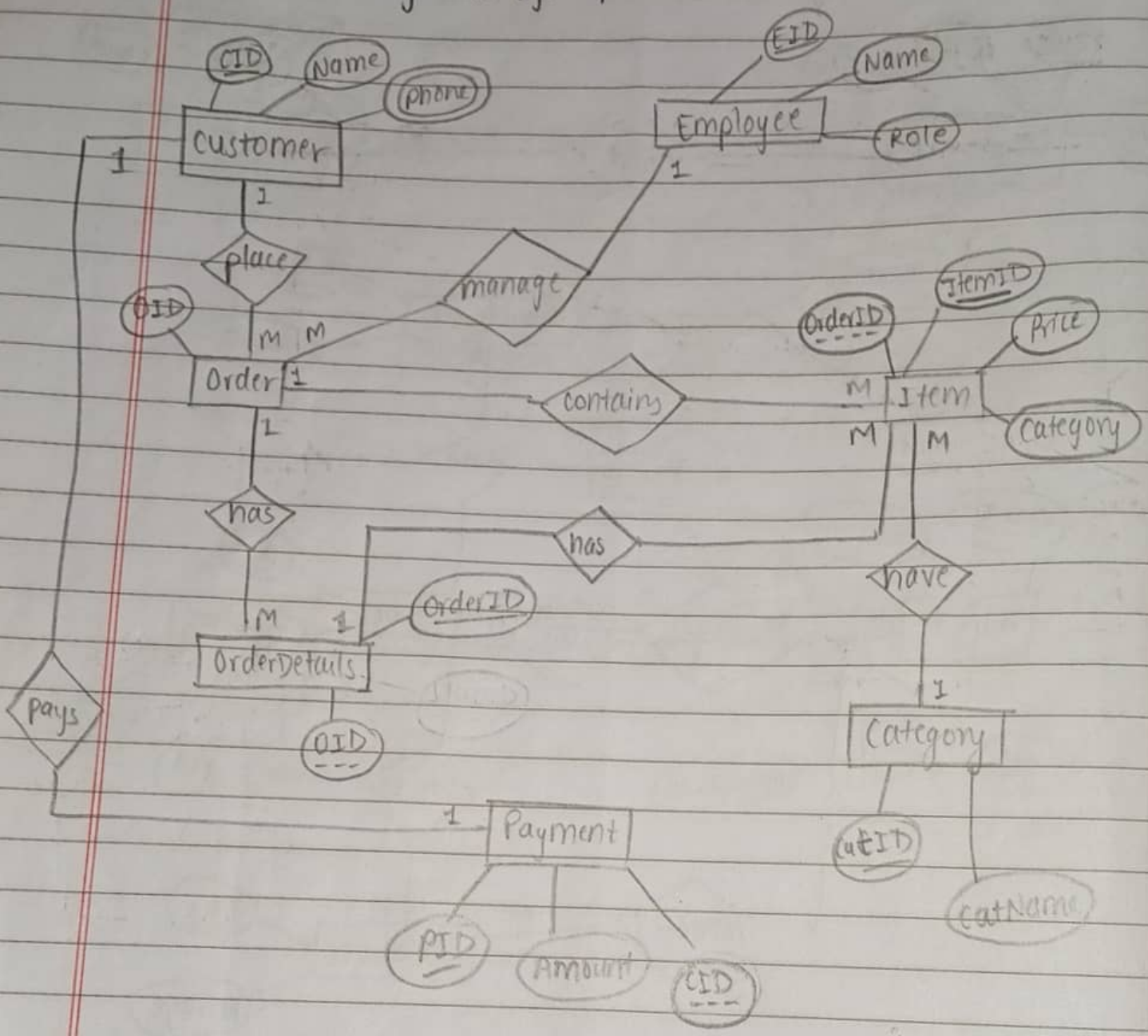
Page: _____

b) Fingerprint Attendance System



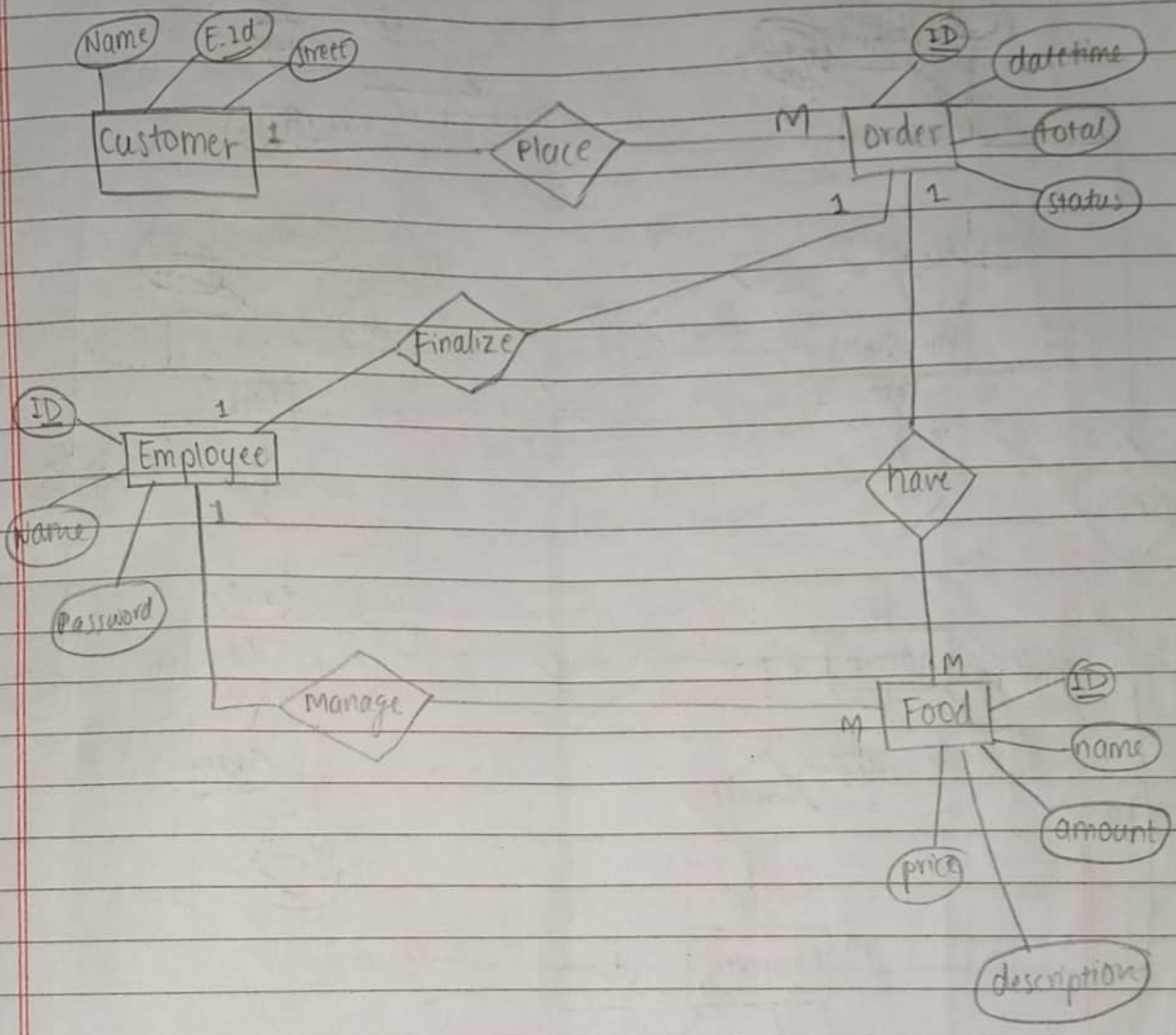
Date:
Page:

c) canteen Management system



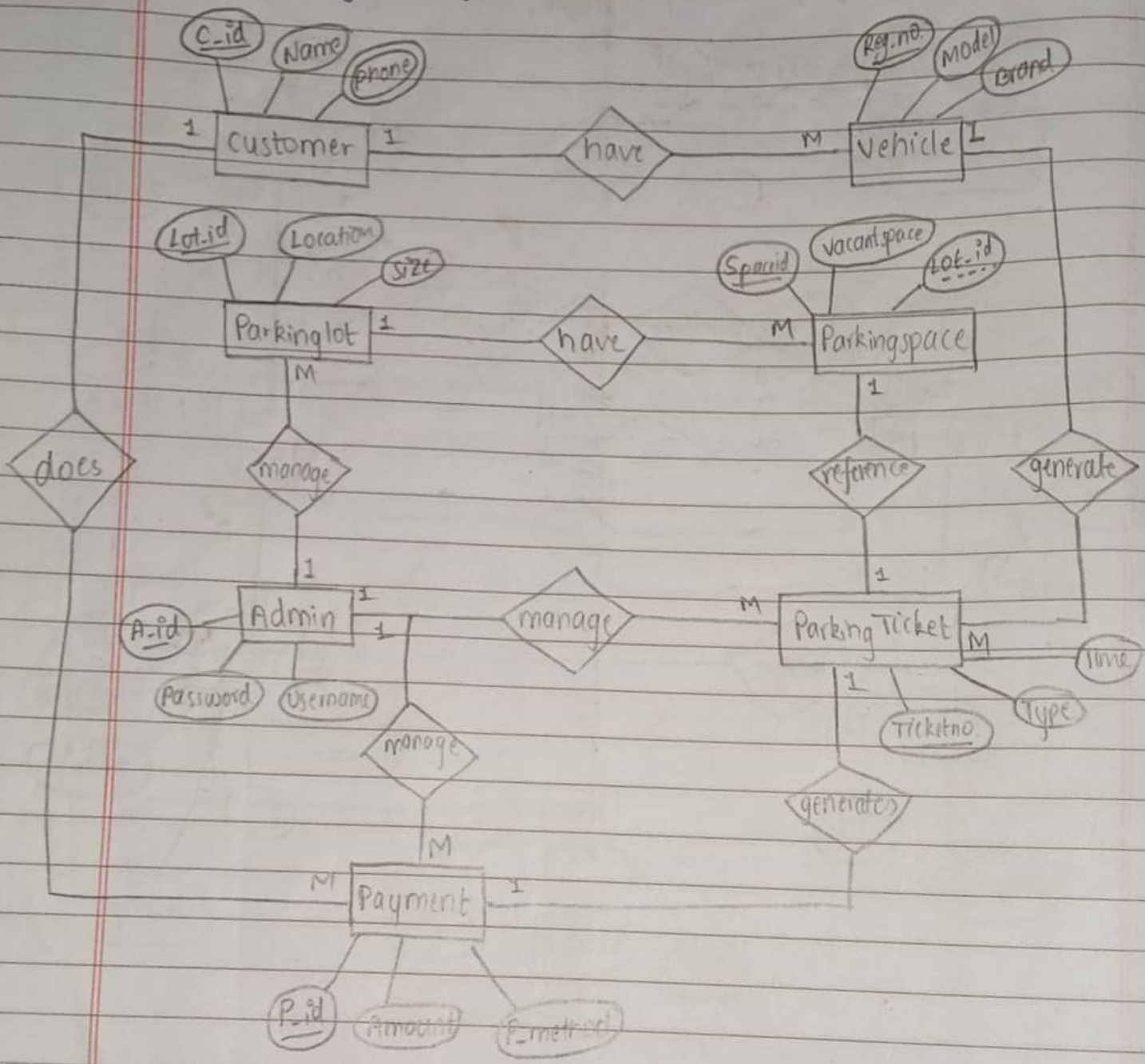
Date:
Page:

d) Online food ordering system



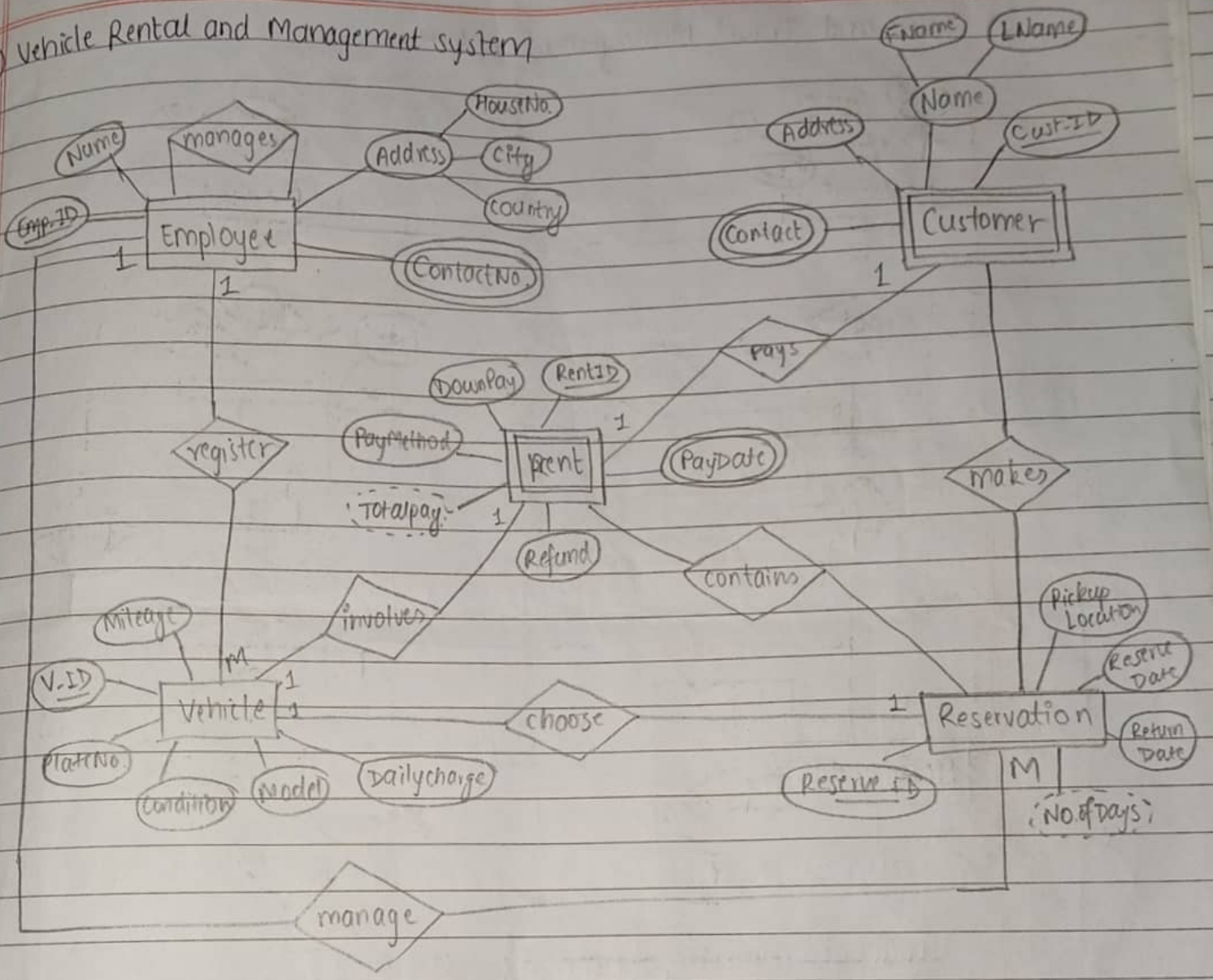
Date:
Page:

e) Parking Management system



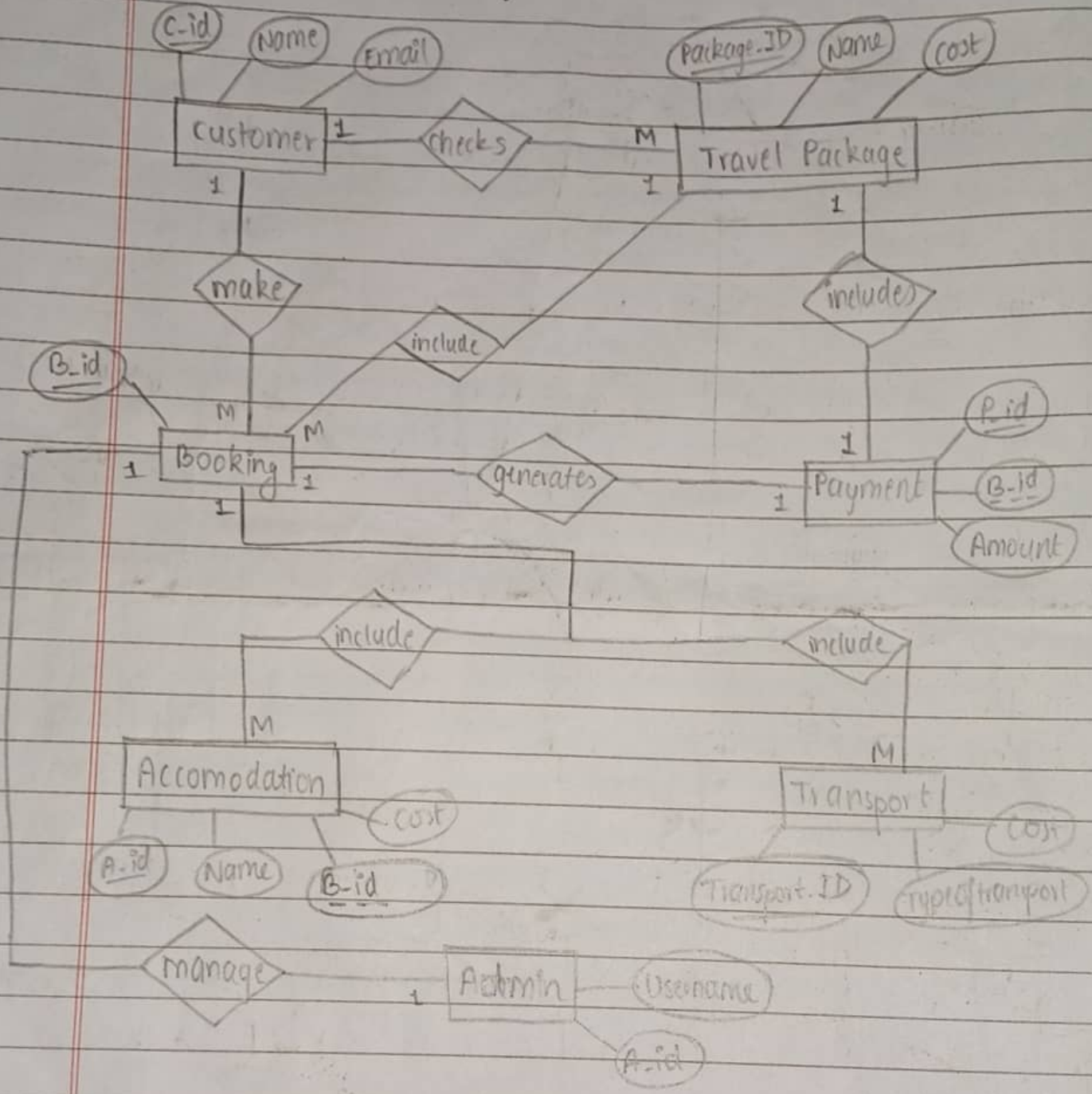
Date :
Page :

1) Vehicle Rental and Management system



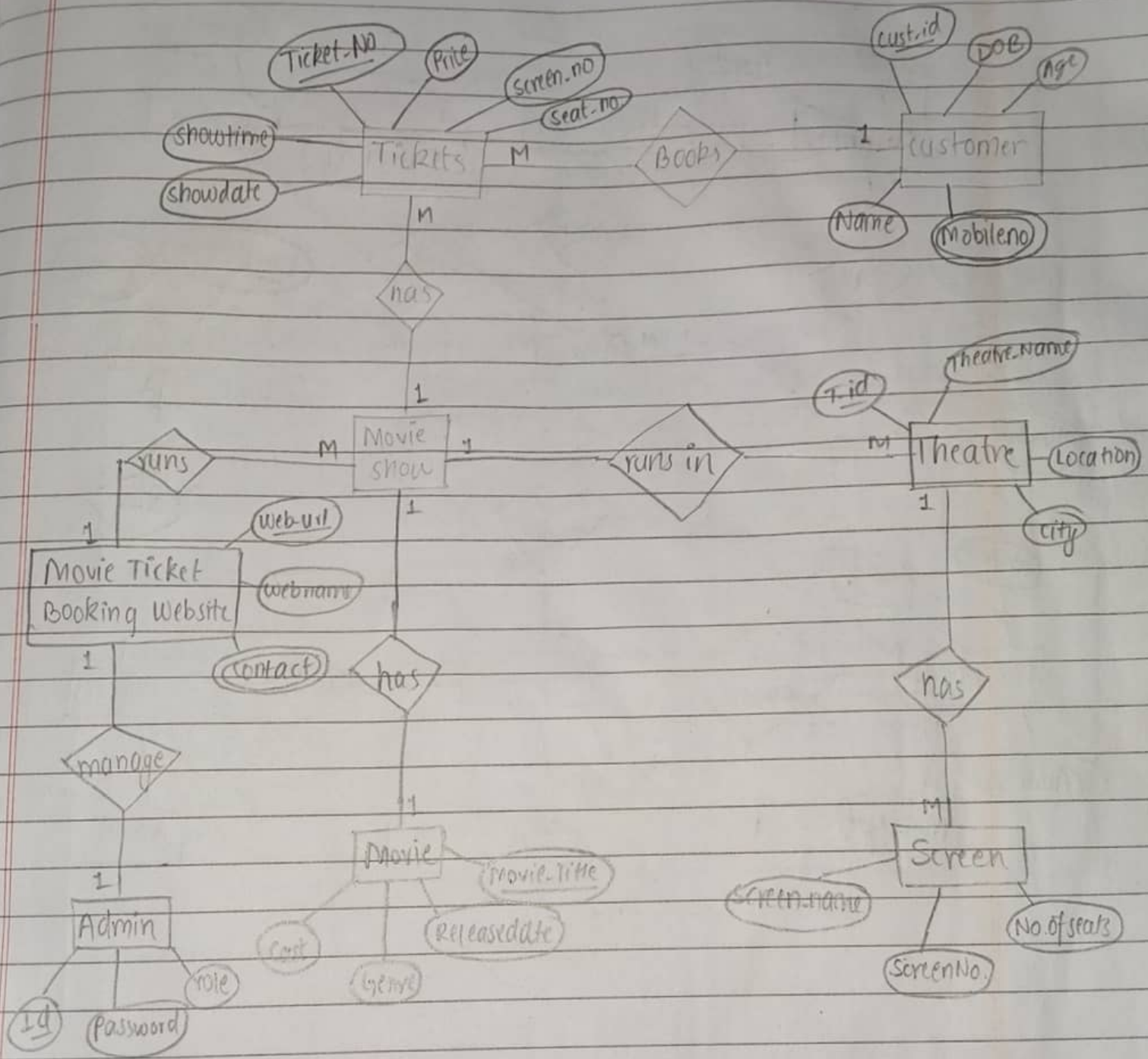
Date :
Page :

9) Tours and Travel Management system



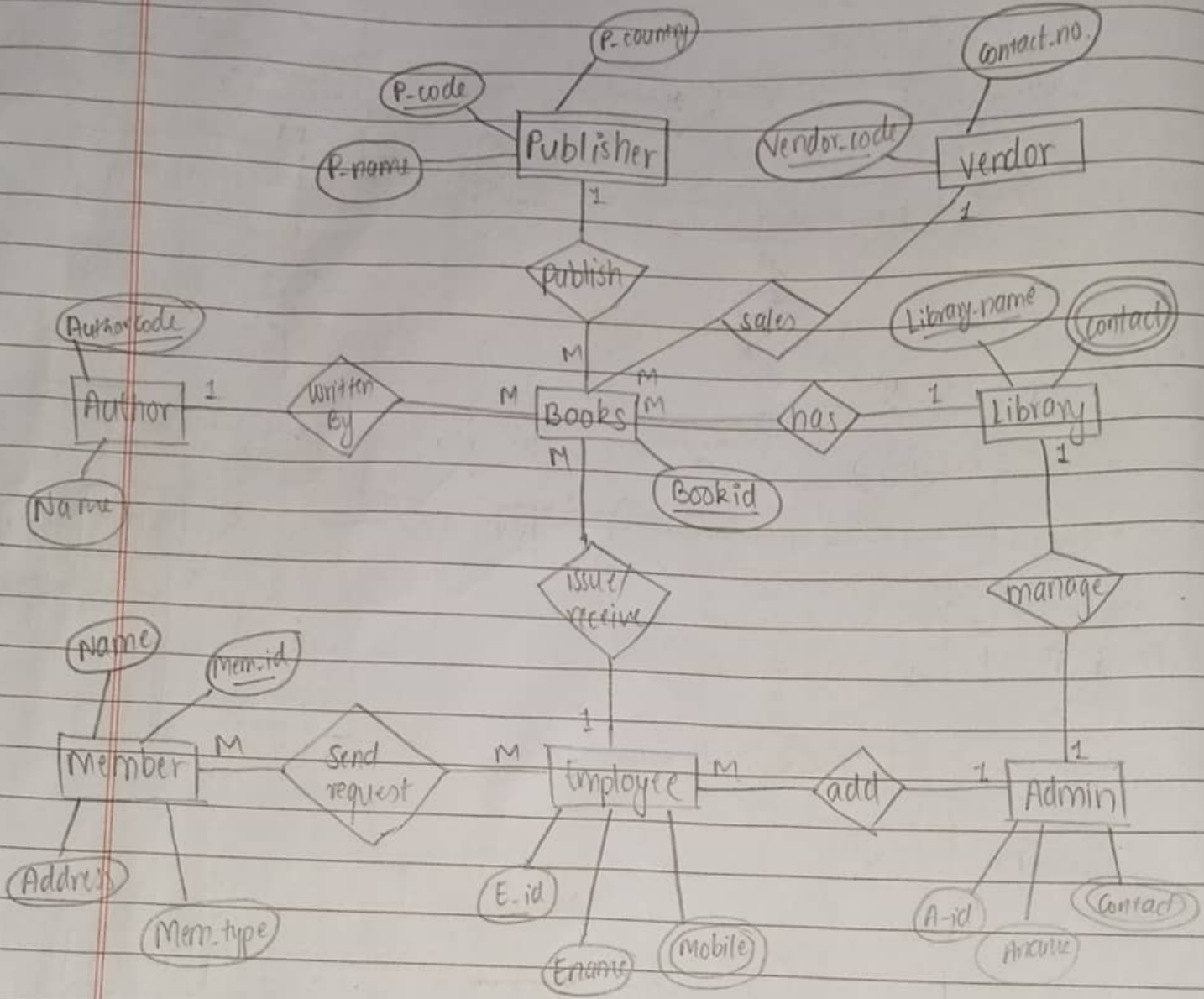
Date :
Page :

h) Cinema Ticket Booking system



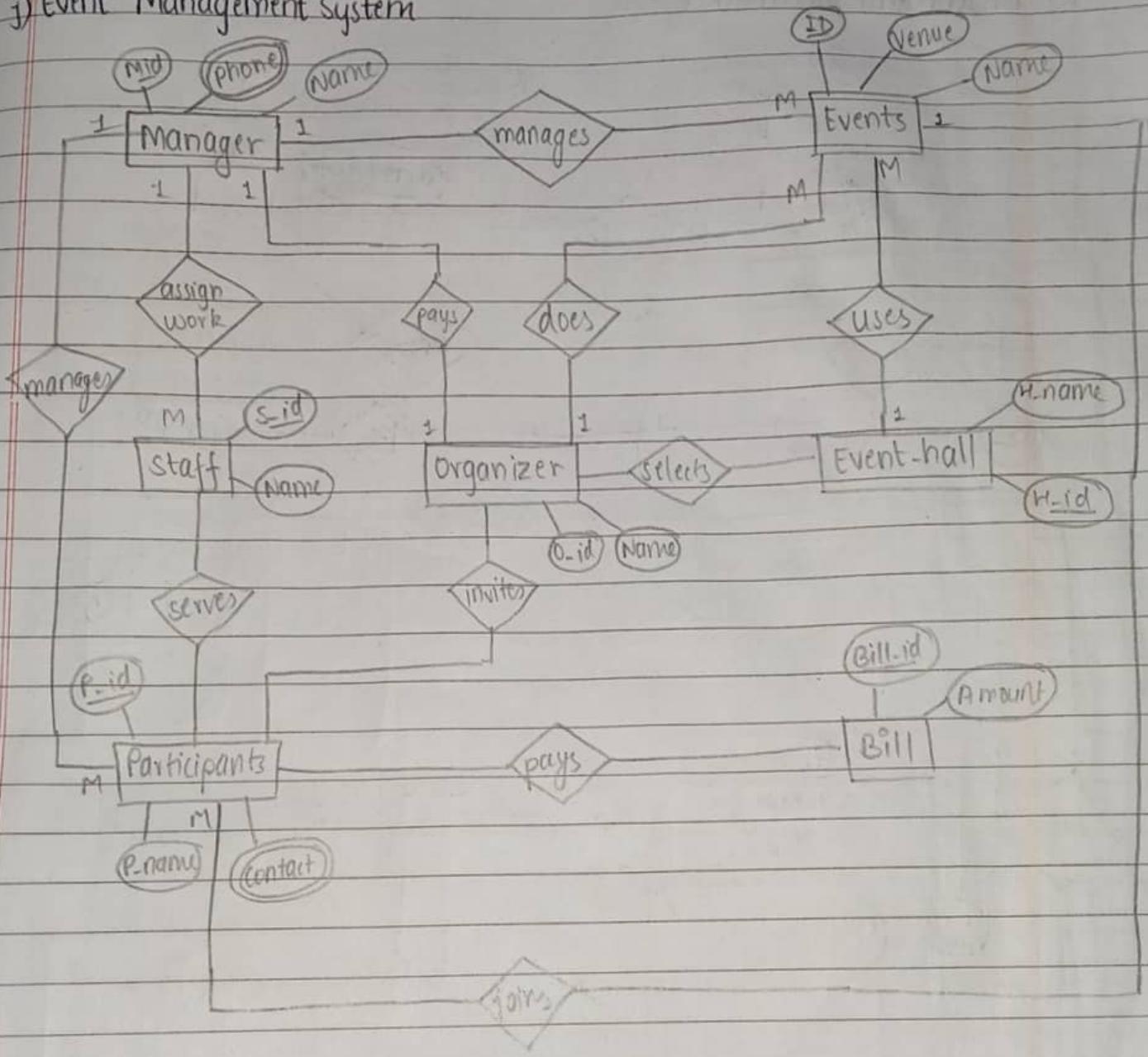
Date :
Page :

i) Library Management System



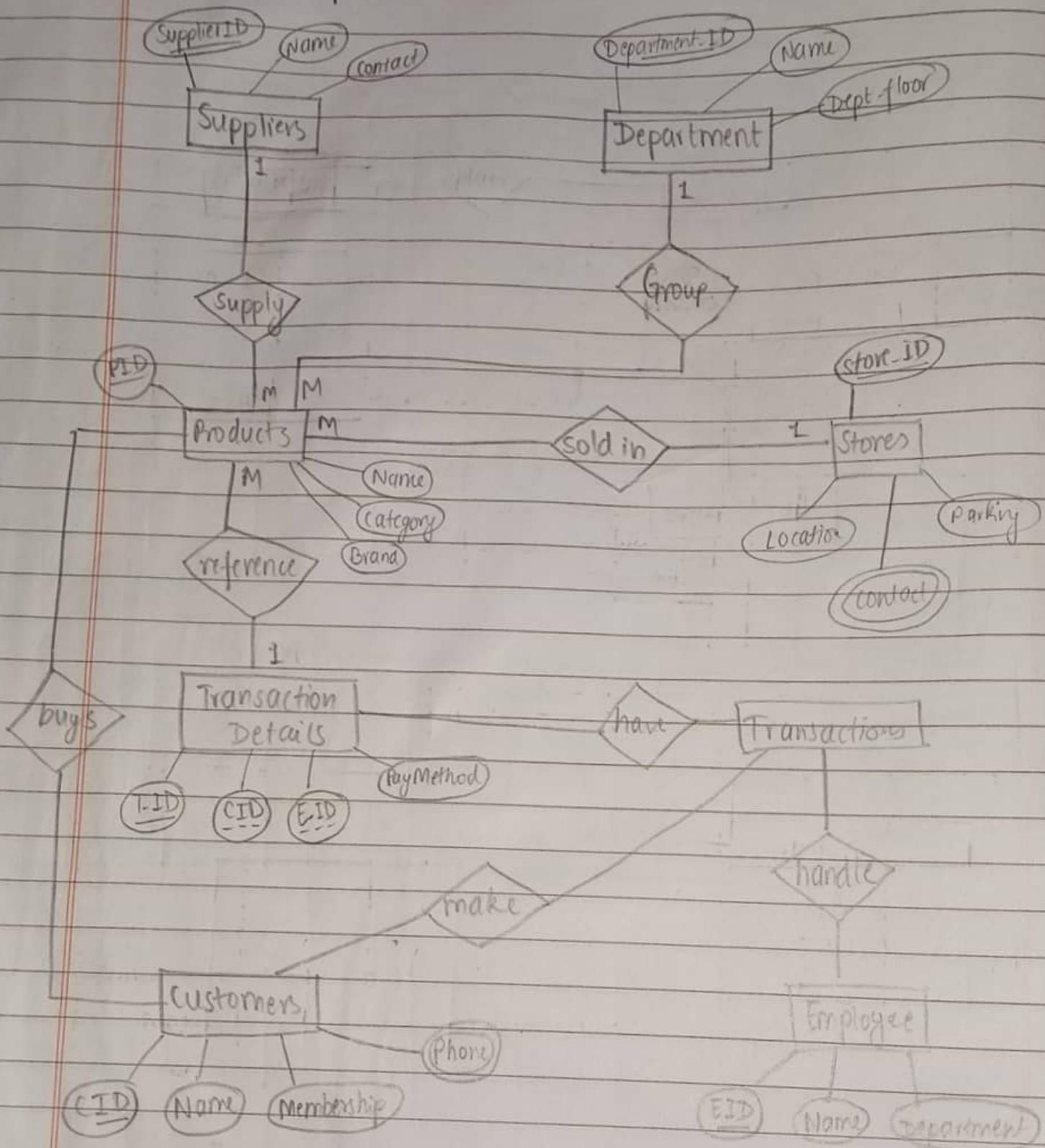
Date :
Page :

j) Event Management System



Date :
Page:

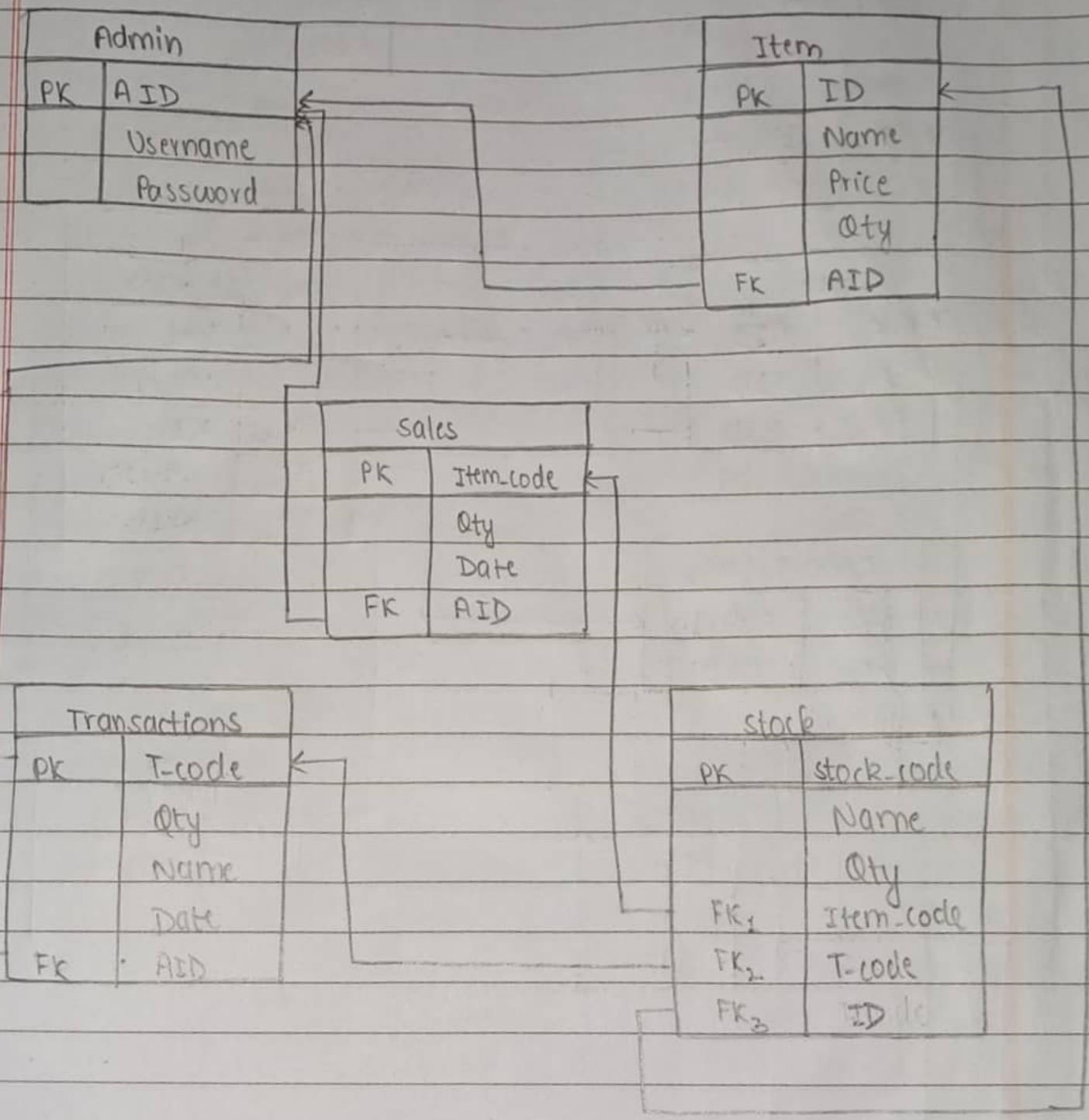
k) Bhatbhateni Supermarket



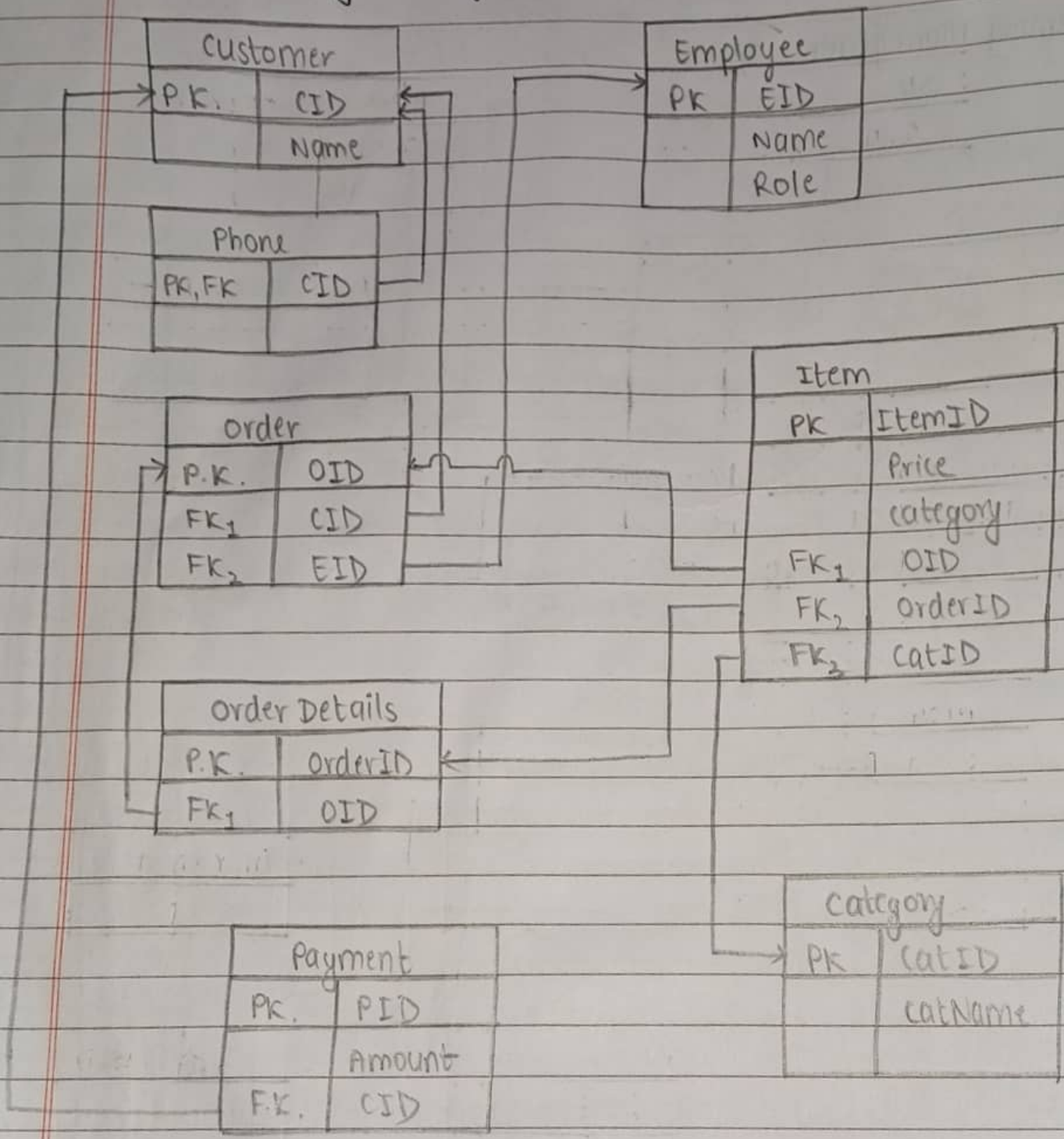
Date :
Page :

18 Convert ER into relational schemas of Que 17 a) c) g) i).

a) Inventory Management system

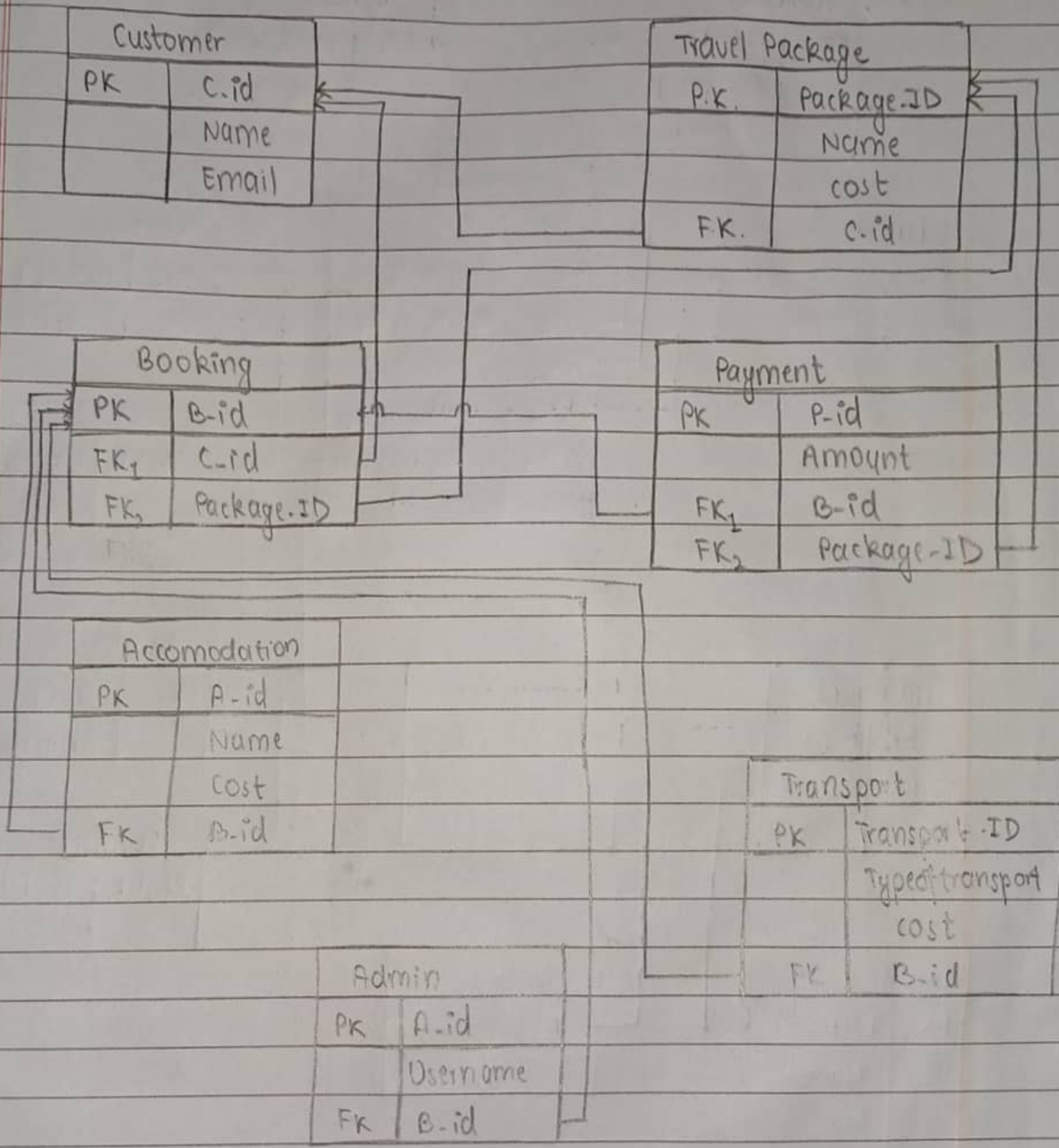


c) Canteen Management System



Date :
Page :

g) Tours and Travel Management system



i) Library Management System