Courier Shipping Management System

Problem Statement:

The goal of this project is to design and implement a database management system for a **Courier Shipping Management System**. This system will manage all aspects of the courier shipping process, including customer information, courier details, vehicle management, employee details, and customer feedback. The database will be designed using PostgreSQL and will support efficient information storage and retrieval.

Entities and Attributes

Customer	Courier	Branch	Employee	Vehicle	Feedback	Insurance	Payment	Delivery Partner	Promotion
CustomerID	Reference ID	City	Employee ID	Vehicle ID (Number Plate)	Feedback ID	Insurance_ID	Payment ID	Reg. No	Company Name
Customer's Name	Weight	Pin code	Employee Name	Distance	Feedback Date	Type	Payment method	Partner Name	Promotion ID
Contact of Sender	Courier Date	Branch ID	Role (Driver,IT Support clerk.)	Capacity	Rating	Coverage_ Amount	Amount	Price Per Courier	Price
Contact of Receiver	Courier Type (Express, Standard, Handle With Care)		Employee Contact Number		Comment	Premium	Payment Date	Start Date	
Street Address	courier Status		Date Of Joining			Claim_Amount	Payment status	End Date	
	Distance								
	Expected Delivery Date								
	Price								
	Profit								
	To_Branch								

Relations:

- One customer can order many couriers(ReferenceID) -> (1 to N)
- One Courier is ordered by only one Customer -> (1 to 1)
- One Vehicle delivers many couriers(ReferenceID) -> (1 to N)
- One Courier is delivered by only one Vehicle -> (1 to 1)
- One employee can work on many couriers.One courier is handled by many employees.(M to N)
- One customer can give many feedbacks -> (1 to N)
- One FeedbackID is refers to only one Customer -> (1 to 1)
- One Courier is delivered to only one branch. -> (1 to 1)
- One Branch handles many couriers. -> (1 to N)
- One payment is associated with only one courier.(1 to 1)
- One courier can be associated with only one payment -> (1 to 1)
- One promotion can be applied to many vehicles -> (1 to N)
- One vehicle promotes only one company promotion -> (1 to 1)
- One role is assigned to one employee at a time -> (1 to 1)
- One Branch can have multiple employees. -> (1 to N)
- One Employee can work with only one branch. -> (1 to 1)
- One Courier is delivered by only one delivery partner. -> (1 to 1)
- One delivery partner can deliver many couriers. -> (1 to N)
- One customer can send a particular courier to one branch only.->(1 to 1)

Participations:

- Customers cannot exist without couriers.
- Couriers cannot exist without customers.
- Couriers cannot exist without a vehicle.
- A branch must have at least one employee.
- Employees must have a branch.
- Feedback cannot exist without Customer.
- Couriers cannot exist without branches.
- Payment cannot exist without courier
- Brand promotion cannot exist without vehicle
- Courier cannot exist without delivery partner

Application Specific Constraint:

1 Customer ID: YYMMDD*****
- YYMMDD: The date on which the customer first sends a courier.
- *****: Five numeric digits.

2 Payment ID: YYMMDD****
- YYMMDD: The date on which the payment was made.
- ****: Four alphanumeric digits.

3 Promotion ID: YYMMDD****
- YYMMDD: The date on which the company's promotion starts.
- ****: Four alphanumeric digits.

4 Branch ID: YYMMDDHHMM
- YYMMDD: The date on which the branch was inaugurated.
- HHMM: The time (hours and minutes) at which the branch was inaugurated.

5 Employee ID: YYMMDD****
- YYMMDD: The joining date of the employee.
- ****: Four alphanumeric digits.

6 Reference ID: YYMMDD****
- YYMMDD: The date on which the courier was registered.
- ****: Four alphanumeric digits.

7 Delivery Partner ID: YYYYMMDD****
- YYYYMMDD: The date on which the delivery partner has joined first time with us.
- ****: Four alphanumeric digits.

8 Vehicle ID: CCNNCCNNNN
- C: Character.
- N: Number. (Same format as RTO).

- Below table shows the price per kilometer (in Rupees) for 1 kg courier of different types

Type	<250 Kms	<500 Kms	<1000 Kms	<2000 Kms	<3000 Kms
Standard	0.5	0.45	0.4	0.35	0.3
Express	0.7	0.65	0.6	0.55	0.5
Handle With Care	1.5	1.4	1.3	1.2	1.1

- Below table shows number of days to deliver courier of different types

Type	<250 Kms	<500 Kms	<1000 Kms	<2000 Kms	<3000 Kms
Standard	2	3	4	5	6
Express	1	1	2	2	3
Handle With Care	3	4	5	6	7

Queries:

- **Basic queries with conditions and joins:**

1. Get all couriers for a particular customer within a given date range.
2. Get the city name travelled by a particular vehicleID. (Ex. GJ06KL0123)
3. Get the lost courier within a given date range.
4. Get the top 5 most rated drivers.
5. Find out the top 5 employees that have been with the company the longest.
6. Get Active Couriers of a particular customer

- **Queries with aggregation in SELECT and aggregated conditions in HAVING clause:**

7. Get the total weight of couriers sent from a particular city.
8. Get the top 5 most frequent destination cities for couriers.
9. Get the average price per courier for all delivery partners.
10. Get the profit earned by a branch in a particular month and a year.
11. Get the total courier and average weight shipped by a given Vehicle. (Ex. GJ06KL0123)
12. Get the total revenue generated by each branch, showing only branches where revenue exceeds 5000 Rupees.
13. Get the number of couriers sent by each customer and show only those who have sent more than 2 couriers.
14. Find branches that have handled more than 1 courier in a specific month.
15. Count of Couriers by Type and Status.
16. Most Frequently Used Payment Methods.
17. Total Number of Couriers Handled by Each Delivery Partner
18. Most Profitable Courier Types
19. Average Delivery Time by Type.

- **Queries having nested queries:**

20. Find vehicles that have not been assigned to any courier.
21. Retrieve all customers who have not provided feedback.

- **Queries having aggregation in nested queries:**

22. Find couriers that have a distance greater than the average distance of couriers in the same branch.
23. Retrieve the vehicles with a capacity greater than the average capacity of all vehicles.
24. List customers whose total payments are higher than the average total payment of all customers.
25. Get the details of couriers that have a higher price than the average price of all couriers.

- **Correlated queries:**

26. Find names of delivery partners who have delivered at least 3 couriers.
27. Find details of drivers who have ratings less than certain average ratings.

- **Queries with division operation:**

28. Retrieve driver details who have driven couriers of all types.
29. Find branches that have managed couriers with all possible status.
30. Find Promotion Companies Details which are promoted by all the vehicles.