COMP6350 – Database Systems
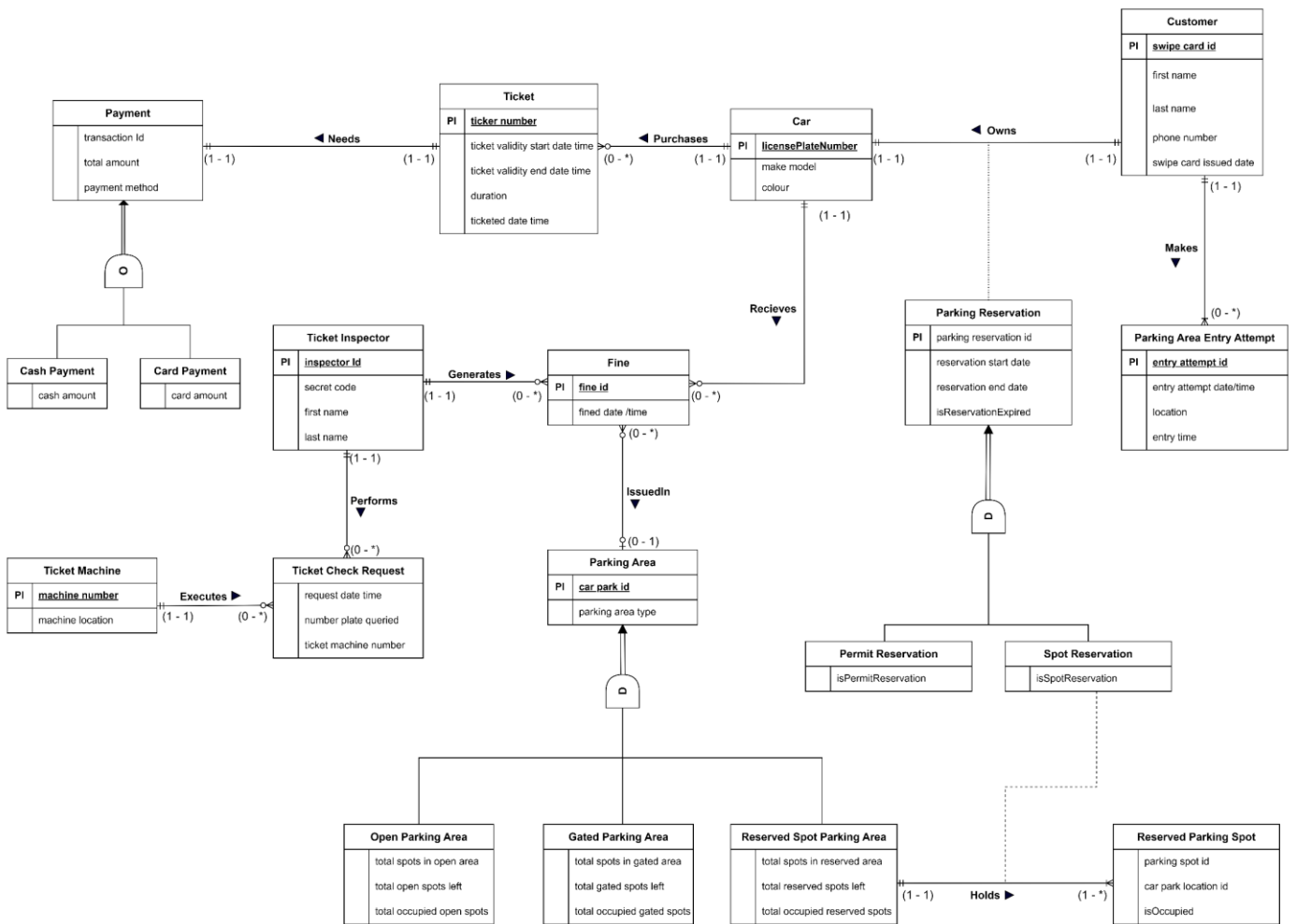
ASSIGNMENT 1 – S2, 2023

DATA MODELLING ASSIGNMENT

Please enter the details below and

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CENTRAL PARKING SYSTEM EER MODEL

Customer

PI	swipe card id
	first name
	last name
	phone number
	swipe card issued date

Payment

transaction Id
total amount
payment method

◄ Needs (1 - 1) (1 - 1)

Ticket

PI	ticker number
	ticket validity start date time
	ticket validity end date time
	duration
	ticketed date time

◄ Purchases (0 - *) (1 - 1)

Car

PI	licensePlateNumber
	make model
	colour

(1 - 1) ◄ Owns (1 - 1) (1 - 1)

(1 - 1)

Makes ▼ (0 - *)

Cash Payment

cash amount

Card Payment

card amount

Ticket Inspector

PI	inspector Id
	secret code
	first name
	last name

Generates ► (1 - 1) (0 - *)

Fine

PI	fine id
	fined date /time

(0 - *)

Recieves ▼

Parking Reservation

PI	parking reservation id
	reservation start date
	reservation end date
	isReservationExpired

Parking Area Entry Attempt

PI	entry attempt id
	entry attempt date/time
	location
	entry time

(1 - 1)

Performs ▼ (0 - *)

IssuedIn ▼ (0 - *)

(0 - 1)

Ticket Machine

PI	machine number
	machine location

Executes ► (1 - 1) (0 - *)

Ticket Check Request

request date time
number plate queried
ticket machine number

Parking Area

PI	car park id
	parking area type

D

Permit Reservation

isPermitReservation

Spot Reservation

isSpotReservation

D

Open Parking Area

total spots in open area
total open spots left
total occupied open spots

Gated Parking Area

total spots in gated area
total gated spots left
total occupied gated spots

Reserved Spot Parking Area

total spots in reserved area
total reserved spots left
total occupied reserved spots

(1 - 1) Holds ► (1 - *)

Reserved Parking Spot

parking spot id
car park location id
isOccupied

Assumptions

1. **All vehicles are considered as cars.**
   With this consideration, the car is added as an entity in the model.

2. **Changing the license plate of the car is not frequent and if the license plate is changed, then it is considered as a new car.**
   With this consideration, the 'license plate number' is made as the PI of the Car Entity.

3. **A customer has a swipe card irrespective of the parking area used and can be identified with it. The id of the swipe card is unique and it will not change even if the swipe card is lost or replaced with a new one. This id is used to identify each customer in the parking system. The Swipe card does not have validity either.**
   With this consideration, the 'swipe card id' is made as the PI of the Customer Entity.

4. **A customer owns only one car at a time and can use it for parking. If the customer gets a new car (that is the license plate number changes), then a new occurrence in the Customer entity is created with a new swipe card id linked to a new occurrence in the Car entity**
   This has been shown in the model with the relationship, cardinality and constraints between the Car Entity and the Customer Entity.

5. **There needs to be a relationship between the Fine Entity and Parking Area Entity.**
   This has been chosen because the system should store the 'car park id' when a fine is generated in either a gated parking area or a reserved spot parking area. For fines generated in Open parking areas, the attribute will not capture any value.

6. **A car can be fined by the same inspector for violating parking rules in the same parking area many times.**
   With this consideration, the 'fine id' attribute is made as the PI of the Fine entity to uniquely identify a Fine entity.

7. **The entire parking area available contains open, gated and reserved parking areas. Each of these parking areas has a unique car park id and it can be either an open, gated or reserved parking area type. The parking areas have total parking spots, the parking spots available for parking and the parking spots occupied. These data will be updated based on each parking area's conditions in the case study.**
   With this consideration, the modelling has been done such that the 'Parking Area Entity' becomes a parent and each of the different parking areas (Open, Gated, Reserved Spot) becomes the child entity of that parent entity. Each of the child entities has separate attributes that capture spot-related data. The uniqueness of the parking area is captured by the 'car park id' attribute in the 'Parking Area Entity' and it is the PI of the entity.

8. **Open and Gated parking areas also have parking spots but are not numbered.**
   This has been shown in the model by incorporating attributes in the 'Open Parking Area' and 'Gated Parking Area' entities that would capture values specific to each parking area.

9. **A reservation is associated with the car and swipe card.**
   This idea has been shown in the model by associating the 'Parking Reservation Entity' with the 'Car Entity' and 'Swipe Car Entity'.

10. **A car and swipe card has only one valid reservation at a time; either a permit reservation or a spot reservation. Also, the spot reservation is quite similar to the permit reservation except that the spot reservation is for a specific spot in the parking area.**
    With this consideration, the modelling has been done such that the 'Parking Reservation Entity' is the parent entity to both types of reservation entities (Permit, Spot). The validity of the reservation is calculated by the attributes in the parent entity and each child entity highlights the reservation type made. The spot & parking area details are also part of the spot reservation entity and this has been incorporated in the model by associating the spot reservation entity with the Reserved Spot Parking Area Entity and Reserved Spot Entity.

11. **The ticket inspector follows the same process to generate a fine in the Spot reservation system as that of the Gated parking system.**
    The ticket inspector checks for a valid permit reservation or valid spot reservation via the Ticket Machine and each of these queries is logged in the 'Ticket check request' entity. This has been shown in the model with the relation of the Ticket Machine entity and Ticket Inspector entity to the 'Ticket check request' entity.

12. **A reserved spot parking area holds at least one parking spot.**
    This has been chosen because the reserved spot parking systems work with reserving specific spots within the parking area and hence a reserved spot parking area should have at least one parking spot. The Reserved Spot Parking entity is related to at least one occurrence of Reserved Spot entity. Each reserved spot entity has an 'isOccupied' attribute to denote if the spot is reserved or not. Additionally, each reserved parking spot is related to a reserved spot parking area id and hence the Reserve Parking Spot entity is considered a weak entity.

13. **No two ticket inspectors can have the same inspector id. A secret code is like a password chosen by each ticket inspector.**
    With this consideration, the 'inspector id' attribute is made as the PI of the Ticket Inspector entity.

14. **Ticket machines are located at different locations in different parking areas. Each machine is independent and does not have any relation to the ticket inspectors or customers using them.**
    With this consideration, the 'machine number' attribute is made as the PI of the Ticket Machine entity.

15. **A license plate number and swipe card id can be associated with many parking reservations (valid and expired).**
    With this consideration, the 'parking reservation id' attribute is made as the PI of the Parking Reservation entity to uniquely identify a parking reservation.