Introduction

1. Entity Relationship Diagram (ERD)
   1. Display the ERD pdf
   * Walk through each entity: Customer, Car, Service, Employee.
   * Customer – table for each customers information
   * Car – table for the information of each car
   * Service – table which has the information about each service
   * Employee – table for the information about each individual emplopyee
2. Cardinality Ratios
   * Car : Service (One to Many):
     + A car can have multiple service over time, and each service must be linked to exactly one car
   * Car : Service (Partial, Full):
     + A car may or may not have a service (partial participation from Car).
     + Every service must be associated with a car (full participation from Service).

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* + Customer : Service (One to Many):
    - A customer can request multiple services, and each service is associated with exactly one customer.
  + Customer : Service (Partial, Full)
    - A customer many or may not have requested services (partial participation from customer)
    - Every service must be linked to a customer because customer\_id is NOT NULL (full participation from Service).

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* + Employee : Service (via ServiceEmployee) (Many to Many)
    - A service can involve multiple employees, and an employee can work on multiple services
  + Employee : Service (via ServiceEmployee) (Partial, Partial)
    - Not every employee is guaranteed to work on services
    - Not every service requires associated employees

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* + Employee : Employee aviability (One to Many)
    - An employee can have multiple unavailability periods
  + Employee : EmployeeAviability (Partial, Full)
    - An employee may or may not be available
    - Every available record must correspond to an employee as employee-id is NOT NULL

2. Data Types for Attributes

1. Justification for Data Types
   * Discuss each attribute's data type selection.
   * Service
     + service\_id - VARCHAR(10) – service ids are max 9 characters long and consist of both letters and numbers
     + dropoff\_date – DATE – it’s a date data type
     + dropoff\_time – TIME – it’s a time data type
     + work\_required – VARCHAR(MAX) – MAX allows it to be descriptive#
     + milage – INT – miles recorded as numbers, so integer is used
     + next\_service – DATE – its a date data type
     + registration – VARCHAR(10) – registrations are mix of letters and numbers, max length is 8
   * Car
     + registration – VARCHAR(10) – longest is 8 characters
     + make – VARCHAR(10) – longest is 10 characters
     + model – VARCHAR(20) – longest is 20 characters
     + date\_of\_manufacture – DATE – date when car was made
   * Customer
     + customer\_id – VARCHAR(10) – mix of letters and numbers
     + cust\_forenames – VARCHAR(10) – Longest name is 9
     + cust\_surname – VARCHAR(10) – Longest name is 9
     + cust\_email – VARCHAR(MAX) – mix of letters,numbers,special characters and can be varying lengths
     + cust\_phone – VARCHAR(15) – longest number is +88487618356732 (15 characters)
   * Employee
     + employee\_id – VARCHAR(10) - consist of both letters and numbers, 10 as UNASSIGNED longest word
     + emp\_forenames – VARCHAR(10) – 7 longest forname
     + emp\_surname – VARCHAR(12) – 11 longest surname
     + emp\_phone – VARCHAR(15) – phone numbers aren’t longer than 15
     + grade – VARCHAR(20) – Senior Mechanic, letters and space, 15 characters long total
   * EmployeeAviability
     + employee\_id - VARCHAR(10) - consist of both letters and numbers, 10 as UNASSIGNED longest word
     + unavailable\_from – DATE – date when employee is away
     + unavailable\_to – DATE – the date when employee is back at work

3. Relational Schema

1. Presentation of Relational Schema
   * Display the tables as they are represented in the schema.
   * Show primary keys and foreign keys clearly in the schema.
     + Primary keys: service\_id, employee\_id, customer\_id, registration.
     + Foreign keys: customer\_id, registration, service\_id, employee\_id.
   * Justify the placement of keys:
     + Primary keys identify unique records in a table.
     + Foreign keys ensure referential integrity and link related tables.

4. Normalisation Process

1. Ensuring 3rd Normal Form (3NF)
   * 1st Normal Form (1NF):
     + All attributes contain atomic values.
     + No repeating groups in the Service table (moved from unnormalized state to 1NF).
   * 2nd Normal Form (2NF):
     + Removed partial dependencies. Introduced the ServiceEmployee table to break down the Service table.
     + Non-key attributes are fully dependent on the primary key.
   * 3rd Normal Form (3NF):
     + Removed transitive dependencies.
     + Split tables like Customer and Car for better structure.
     + Ensured all non-key attributes are dependent only on the primary key.
   * Discuss the steps taken to achieve full normalization and avoid redundancy.

5. Assumptions Made During the Design Process

1. Assumptions
   * Single Customer per Car: A customer can only own one car per entry in the database.
   * Service Frequency: Each service is recorded once per car; there is no tracking of multiple services at once for the same vehicle.
   * Employee Availability: Employees are assumed to be able to work on multiple services at the same time.