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DATABASE SYSTEM

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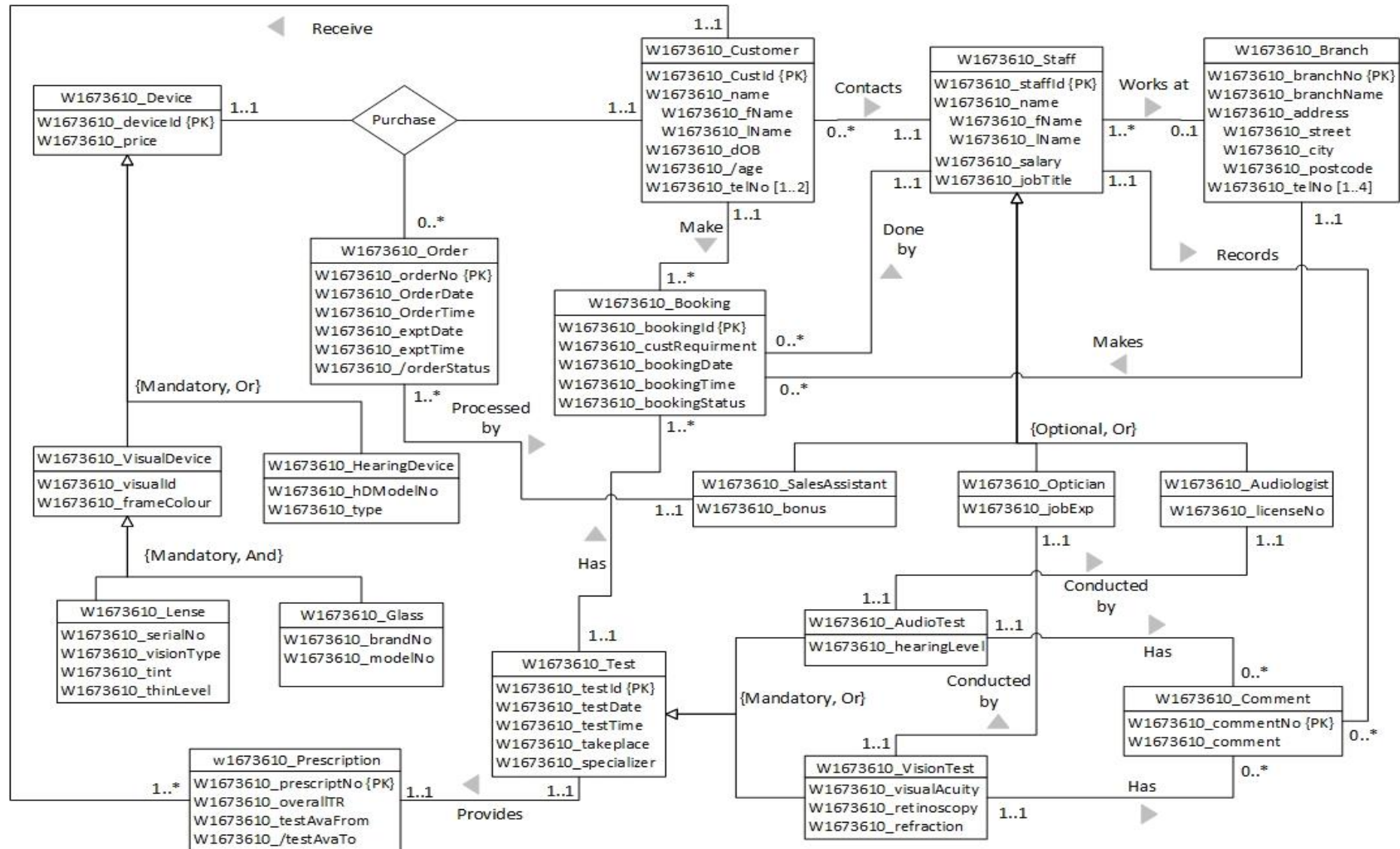
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1. Entity Relationship model for AudioVizzion



2. Data dictionary for identify Entity

2.1 Identify Entity

	Entity name	Justification
1	W1673610_Branch	Branch is a business unit that provides devices and testing to the customers.
2	W1673610_Staff	Group of people are representing in the Staff (employee).
3	W1673610_SalesAssistant	Direct product supplies to the customers.
4	W1673610_Optician	Specialised member for a vision testing.
5	W1673610_Audiologist	Specialised member for a hearing testing.
6	W1673610_Customer	A person who wants to get services and buy devices from AudioVizzion.
7	W1673610_Booking	An arrangement for getting a service.
8	W1673610_Test	To represent services that AudioVizzion offers.
9	W1673610_AudioTest	The service to check patient hearing level.
10	W1673610_VisionTest	The service to check patient's eye.
11	W1673610_Comment	Opinions for tests.
12	W1673610_Prescription	To represent the summery of test results.
13	W1673610_Order	The person who place an order for a device from AudioVizzion.
14	W1673610_Device	Represent products/items that AudioVizzion offers.
15	W1673610_VisualDevice	To represent visual aid/visual kit.
16	W1673610_Lens	AudioVizzion offers, to their Customer to select various type of lens for the device.
17	W1673610_Glass	AudioVizzion offers, to their Customer to select various type of glass for the device.
18	W1673610_HearingDevice	To represent hearing aid/hearing kit.

Table 1-Entities

2.2 Specialization/ Generalization

General entity		Specialised entity	Justification
<i>Staff</i> superclass and the <i>Optician</i> , <i>Audiologist</i> and <i>SalesAssistant</i> are subclasses; <i>Staff</i> entity classified as <i>SalesAssistant</i> , <i>Optician</i> , <i>Audiologist</i>			
1	W1673610_Staff	W1673610_SalesAssistant	The <i>SalesAssistant</i> subclass inherits all the attributes of the <i>Staff</i> superclass (<i>staffId</i> , <i>name</i> , <i>salary</i> , <i>jobTitle</i>) together with those specifically associated with <i>SalesAssistant</i> subclass such as <i>bonus</i> (Connolly & Begg, 2014)
2	W1673610_Staff	W1673610_Optician	The <i>Optician</i> subclass inherits all the attributes of the <i>Staff</i> superclass (<i>staffId</i> , <i>name</i> , <i>salary</i> , <i>jobTitle</i>) together with those specifically associated with <i>Optician</i> subclass as <i>jobExp</i> (Connolly & Begg, 2014)
3	W1673610_Staff	W1673610_Audiologist	The <i>Audiologist</i> subclass inherits all the attributes of the <i>Staff</i> superclass (<i>staffId</i> , <i>name</i> , <i>salary</i> , <i>jobTitle</i>) together with those specifically associated with <i>Audiologist</i> subclass as <i>licenseNo</i> (Connolly & Begg, 2014)
<i>Test</i> superclass and the <i>AudioTest</i> , <i>VisionTesting</i> are subclasses; <i>Test</i> entity classified as <i>AudioTest</i> and <i>VisionTest</i>			
4	W1673610_Test	W1673610_AudioTest	The <i>AudioTest</i> subclass inherits all the attributes of the <i>Test</i> superclass (<i>testId</i> , <i>testDate</i> , <i>testTime</i> , <i>takePlace</i>) together with those specifically associated with <i>AudioTest</i> subclass as <i>hearingLevel</i> (Connolly & Begg, 2014)
5	W1673610_Test	W1673610_VisionTest	The <i>VisionTest</i> subclass inherits all the attributes of the <i>Test</i> superclass (<i>testId</i> , <i>testDate</i> , <i>testTime</i> , <i>takePlace</i>) together with those specifically associated with <i>VisionTest</i> subclass such as <i>visualAcuity</i> , <i>retinoscopy</i> , <i>refraction</i> (Connolly & Begg, 2014)
<i>Device</i> is a superclass and the <i>VisualDevice</i> , <i>HearingDevice</i> are subclasses; <i>Device</i> entity classified as <i>VisualDevice</i> and <i>HearingDevice</i>			
6	W1673610_Device	W1673610_VisualDevice	The <i>VisualDevice</i> subclass inherits all the attributes of the <i>Device</i> superclass (<i>deviceId</i> , <i>price</i>) together with those specifically associated with <i>VisualDevice</i> subclass such as <i>visualId</i> and <i>framecolour</i> (Connolly & Begg, 2014)
7	W1673610_Device	W1673610_HearingDevice	The <i>HearingDevice</i> subclass inherits all the attributes of the <i>Device</i> superclass (<i>deviceId</i> , <i>price</i>) together with those specifically associated with <i>HearingDevice</i> subclass such as <i>hDModelNo</i> and <i>type</i> (Connolly & Begg, 2014)

<i>Glass and Lens are subclasses of VisualDevice, which is a subclass of Device; VisualDevice sub entity classified as Lens and Glass</i>			
8	W1673610_Device	W1673610_Lens	The attributes of the <i>Device</i> superclass (<i>deviceId</i> , <i>price</i>) and the attribute of <i>VisualDevice</i> subclass (<i>visualId</i> , <i>framecolour</i>) are inherited by the <i>Lens</i> subclass, which also has its own additional attributes called <i>serialNo</i> , <i>visionType</i> , <i>tint</i> , <i>thinLevel</i> (Connolly & Begg, 2014)
9	W1673610_Device	W1673610_Glass	The attributes of the <i>Device</i> superclass (<i>deviceId</i> , <i>price</i>) and the attribute of <i>VisualDevice</i> subclass (<i>visualId</i> , <i>framecolour</i>) are inherited by the <i>Glass</i> subclass, which also has its own additional attributes called <i>brandNo</i> , <i>ModelNo</i> (Connolly & Begg, 2014)

Table 2-Specialization/ Generalization

3. Data dictionary for Relationships and Multiplicities

3.1 Binary relationship

Entity name	Multiplicity	Relationship	Multiplicity	Entity name	Justifications for the multiplicity
W1673610 – Staff	1..*	Works at	0..1	W1673610 – Branch	Not all Staff members <i>works at</i> a specific branch (optional participation for staff) (Connolly & Begg, 2014)
					Many Staff members <i>works at</i> one specific Branch
					One Branches <i>have</i> many Staff members
					All Branch have Staff (Connolly & Begg, 2014)
Staff and branch have Many to One relationship, (Connolly & Begg, 2015) Each Branch has one or many members of staff; Many Staff members works at zero or one Branch					
W1673610 – Customer	0..*	Contacts	1..1	W1673610 – Staff	Not all Staff <i>contacted by</i> a specific Customer
					Many Customers <i>contacts</i> only one Staff member
					All customers have to <i>contacts</i> (mandatory participation for Customer)
					A one specific Staff member <i>contacted by</i> many customers
Customer and staff have many to one relationship, A specific Staff member conducted by zero or many customers; Each Customers contact one Staff member					
W1673610 – Customer	1..1	Make	1..*	W1673610 – Booking	One Customer <i>make</i> only one Booking
					A specific Customer <i>make</i> many Bookings

					One Booking <i>made by</i> only one specific Customer
					Many Booking <i>made by</i> one Customer
Customer and booking have one to many relationships, A specific test booking makes by one customer; One Customers make one or many bookings					
W1673610 – Booking	0..*	Done by	1..1	W1673610 – Staff	Not all Staff <i>does</i> Booking (booking can be cancelling)
					Many Bookings <i>done by</i> only one Staff member
					Each member of <i>Staff does</i> many Bookings for a patient
					All Bookings are <i>done by</i> a Staff member
Booking and staff have many to one relationship, A specific Staff member do zero or many bookings; Many bookings done by one Staff member					
W1673610 – Test	1..1	Has	1..*	W1673610 – Booking	A one specific Test <i>has</i> only one Booking
					A one specific Test <i>has</i> many Bookings
					One Booking <i>had</i> only one Test
					Many Bookings <i>had</i> only one Test
Test and Booking have one to many relationships, A specific Booking had one Test; A specific Test has one or many bookings (Connolly & Begg, 2015)					
W1673610 – Customer	1..1	Receive	1..*	W1673610 – Prescription	One Customer <i>receive</i> only one Prescription
					One Customers <i>receive</i> many Prescription
					One Prescription <i>received by</i> only one Customer
					Many Prescriptions <i>receive by</i> only one Customer
Customer and Prescription have one to many relationships, A specific Prescription received by one customer; A specific Customer receive one or many Prescriptions					
W1673610 – Order	1..*	Processe d by	1..1	W1673610 – SalesAssist ant	One Order <i>processed by</i> only one SalesAssistant
					Many Orders <i>processed by</i> only one SalesAssistant
					Each SalesAssistant <i>process</i> only one Order
					Each SalesAssistant <i>process</i> many Orders
Order and Sales Assistant have many to one relationship, A specific Sales Assistant process one or many Orders; Many Orders processed by one Sales Assistant					
W1673610 – VisionTest	1..1	Conducte d by	1..1	W1673610 – Optician	One Vision test <i>conducted by</i> only one Optician
					A specific Vision test <i>conducted by</i> one specific Optician
					One specific Optician <i>conducts</i> only one Vision test

					A specific Optician <i>conducts</i> one Vision test
Vision test and optician have one to one relationship, A specific optician conducts one vision test; A specific vision test conducted by one optician					
W1673610 – AudioTest	1..1	Conducte d by	1..1	W1673610 – Audiologist	One Audio test <i>conducted by</i> only one specific Audiologist
					A specific Audio test <i>conducted by</i> one specific Audiologist
					One Audiologist <i>conducts</i> only one specific Audio test
					A specific Audiologist <i>conducts</i> one specific Audio test
Audio test and Audiologist have one to one relationship, A specific Audiologist conducts one Audio test; A specific Audio test conducted by one Audiologist					
W1673610 – Staff	1..1	Records	0..*	W1673610 – Comment	One Staff <i>records</i> only many comments (Connolly & Begg, 2014)
					Not all Staff <i>records</i> comments
					All Comments are <i>recorded</i> (mandatory participation for Comment)
					Many <i>comments recorded by</i> only one Staff member
Staff and Comment have one to many relationships, Each comment recorded by one Staff member; A specific staff member records zero or many comments					
W1673610 – Test	1..1	Provides	1..1	W1673610 – Prescriptio n	One test <i>provides</i> only one Prescription
					One prescription <i>provides by</i> only one test (Connolly & Begg, 2014)
					A specific test <i>provides</i> one Prescription
					A specific prescription <i>provides by</i> one specific test
Test and Prescription have one to one relationship, A specific Prescription provided by one Test; A specific Test provides one Prescription					
W1673610 – VisionTest	1..1	Has	0..*	W1673610 – Comment	Each Vision test <i>has</i> many comments
					Not all Vision test <i>has</i> comments (optional participation for a test)
					Many comments <i>are in</i> only one Vision test
					All comments <i>are in</i> one vision Test (Connolly & Begg, 2014)
Vision test and comment have one to many relationships, Each comment had one Vision test; A specific Vision test has zero or many comments					
W1673610 – AudioTest	1..1	Has	0..*	W1673610 – Comment	Each Audio test <i>has</i> many comments
					Not all Audio test <i>has</i> comments (optional participation for a test)
					Many comments <i>are in</i> only one Audio test

					All comments <i>are in</i> one Audio Test (Connolly & Begg, 2014)
Audio test and comment have one to Many relationships, Each comment had one Audio test; A specific Audio test has zero or many comments					
W1673610 – Branch	1..1	Makes	0..*	W1673610 – Booking	Many Bookings are <i>made by</i> one Branch
					One Branch makes <i>many</i> Bookings
					All Bookings are <i>made</i> (mandatory participation for Booking)
					Not all Branch (member) <i>makes</i> Bookings
Branch and Booking have one to Many relationships, Each Booking mad one Branch; A specific Branch makes zero or many Bookings					

Table 3-Binary Multiplicity

3.2 Non-Binary relationship

Entity	Multipli city	Relation ship	Multipli city	Entity	Justification
W1673610 – Customer	1..1	Purchase	0..*	W1673610 – Order	Many Orders are <i>purchased by</i> one Customer
					One Customer <i>purchase</i> many Orders
					All Orders are <i>purchased</i>
					Not all Customer <i>purchase</i> orders
W1673610 – Customer Order	1..1	Purchase	1..1	W1673610 – Device	One Device <i>purchased by</i> only one Customer
					A specific Customer <i>purchase</i> one Device
					A specific Device <i>purchased by</i> one Customer
					One Customer <i>purchase</i> only one Device
A specific customer makes zero or many Orders purchase for only one device at a time					

Table 4-Non-Binary Multiplicity

Customer make an order to purchase a device. So, purchased Order responsible by Sales Assistance at a Branch. A customer makes one order; device is allocated to that order. A customer makes many orders; devices are separately allocated to those orders (by deviceId and orderNo). For an order there have only one device.

3.3 Constraints on Specialization/ Generalization

The relationship between subclass and super class (1:1)

- Specialization/Generalization the relationship between Staff with SalesAssistant, Optician, Audiologist

Staff entity is optional and disjoint {optional, or}, as not all members of staff are SalesAssistant or Optician or Audiologist, and also a single member of staff cannot be overlap with SalesAssistant and Optician and Audiologist (Connolly & Begg, 2014).

- Specialization/Generalization the relationship between Test with AudioTest and VisionTest. Test entity is mandatory and disjoint {mandatory, or}, as Test must be either AudioTest or VisionTest but cannot be both (Connolly & Begg, 2014). [the same booking id can't do two tests]

- Specialization/Generalization the relationship between Device with VisualDevice, HearingDevice, and Lens, Glass.

Device entity is mandatory and disjoint {mandatory, or}, as Device must be Visual Device (as visual device nondisjoint with lens and glasses {mandatory, and} can be both lens and glass) or Hearing Device but cannot be both (Connolly & Begg, 2014).

4. Data dictionary for attributes and primary keys

For some entities I use primary keys, Multi-valued attributes, derived attributes.

	Entity name	Attributes for this entity (include PK)	Justification
1	W1673610 – Branch	W1673610_branchNo {PK}	Uniquely identities a branch
		W1673610_branchName	Name of the branch
		W1673610_address	
		W1673610_street	Street of the branch
		W1673610_city	City of the branch
		W1673610_postcode	Postcode of the branch
		W1673610_telNo [1..4]	telephone numbers for branch
2	W1673610 – Staff	W1673610_staffId {PK}	Uniquely identities the employee
		W1673610_name	
		W1673610_fName	First name of the employee in the branch
		W1673610_lName	Last name of the employee in the branch
		W1673610_salary	Salary of the employee
		W1673610_jobTitle	The position of the employee in the branch
3	W1673610 – SalesAssista nt	W1673610_bonus	Bonus for a sales assistant
4	W1673610 – Optician	W1673610_jobExp	Job experience for an optician
5	W1673610 – Audiologist	W1673610_licenseNo	government License number for an audiologist
6	W1673610 – Customer	W1673610_custId {PK}	Uniquely identities a patient/customer
		W1673610_name	
		W1673610_fName	First name of a customer
		W1673610_lName	Last name of a customer
		W1673610_dOB	Date of birth for a customer
		W1673610_/age	Customer age (calculate current date from dob)
		W1673610_telNo [1..2]	Telephone number for a customer

7	W1673610 – Booking	W1673610_bookingId {PK}	Uniquely identifies a patient booking for a test
		W1673610_custRequirment	Customer requirements; what actually customer wants to test.
		W1673610_bookingDate	Test booking date (customer contact date)
		W1673610_bookingTime	Test booking time (customer contact time)
		W1673610_bookingStatus	Booking confirmation (confirmation- true/false)
8	W1673610 – Test	W1673610_testId {PK}	Uniquely identifies a test
		W1673610_testDate	Staff member given date for the patient to the request test
		W1673610_testTime	Staff member given time for the patient to the request test
		W1673610_takePlace	Staff member given place for the patient to the request test
		W1673610_specializer	Staff member given specialised person for the patient to the request test
9	W1673610 – AudioTest	W1673610_hearingLevel	Measures the patient's hearing level
10	W1673610 – VisionTest	W1673610_visualAcuity	Measures patient visual Acuity
		W1673610_retinoscopy	Measures patient eye retinoscopy
		W1673610_refraction	Measures patient eye refraction
11	W1673610 – Comment	W1673610_commentNo {PK}	Each comment uniquely identifies by comment number
		W1673610_comment	Opinion for an individual sub-test
12	W1673610 – Prescription	W1673610_prescriptNo {PK}	Uniquely identifies an overall test result
		W1673610_overallITR	Detailed summary of the test results
		W1673610_testAvaFrom	Date from which it is available
		W1673610_/testAvaTo	date until when it is available (add years to testAvaFrom)
13	W1673610 – Order	W1673610_orderNo {PK}	Uniquely identifies a customer ordering
		W1673610_orderDate	Customer purchase date
		W1673610_orderTime	Customer purchase time
		W1673610_exptDate	Expected collecting date
		W1673610_exptTime	Expected collecting time
		W1673610_/status	Status; for customers collected product yet (From exptDate and actual date)
14	W1673610 – Device	W1673610_deviceId {PK}	Uniquely identifies a purchased device
		W1673610_price	Price of the device
15	W1673610	W1673610_visualId	Owns visual identification number

	VisualDevice	W1673610_frameColour	Device frame colour
16	W1673610 - Lens	W1673610_serialNo	Own serial number for a lens
		W1673610_visionType	Own may Types of vision
		W1673610_tint	Tint of lens
		W1673610_thinLevel	Level of thinness
17	W1673610 - Glass	W1673610_brandNo	Own Brand number for a glass
		W1673610_modelNo	Own model number for a glass
18	W1673610 - HearingDevi ce	W1673610_hDModelNo	Own model number for a hearing device
		W1673610_type	type that customer requested hearing device

Table 5-Attributes

5. Reference

Connolly, T. & Begg, C., 2014. *Database System*. fourth ed. India: Pearson.

Connolly, T. & Begg, C., 2015. *Database Systems*, University of the west of Scotland: Person.

6. Assumptions

- i. In this company there have large number of branches. So, we need to separately identify those branches.
- ii. All the staff members are involved in to AudioVizzion company. And in that there have many branches to sell devices and services. And all the staff members are not involved into a specific branch.
- iii. A branch has 1 - 4 contact numbers for customers to contact with the staff. (min-1, max-4)
- iv. Every branch are offers services and tests, So I assume a customer first contact a member of staff at a branch to make a booking for a test (most convenient: through the staff member).
- v. Comments are given by a staff member that I assume that comments are represent that individual sub testing (audio, vision testing) "comments" such as visual acuity: 20/20
- vi. As I have assumed, In the Prescription give a detailed summary of the published results (with the comments). Such as Visual acuity: Normal (20/20)
- vii. A customer can make two appointments such as vision and hearing tests. But Staff member who is confirm those bookings.
- viii. For a test there have only one prescription. And a customer can get one or many prescriptions because if a customer did two tests so, then customer can get two prescriptions.
- ix. At the end of a test the staff member records no. of comments so I assume comments are not essential for every sub test.
- x. At a time one booking has only one test. Once the test end then after that other test comes one by one. If customer books two tests, then one after the other test. (at a time, a customer can appear a one test)
- xi. A customer can make an order, or do only a test. Because if customer don't have problem on hear, or eye then they don't want to order a device.
- xii. I assume a person can purchase many orders. But those many orders can be represent one device at a time.