1DV503/1DT903 Database Technology and Modeling

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Task 1. The Hospital database

1.1 Identify all entities and their attributes from the description of database requirements using the following Table template:

Entity	Attribute	Attribute Type	Key Attribute	Value sets of attributes (type, min, max, value, NULL/NOT NULL)
DEPARTMENT	Unique identifier	Simple	true	Integer min 1, not null
	Name	Simple	false	Characters (200), not null
PHYSICIAN	Unique ID	Simple	true	Integer min 1, not null
	Name (first Name, Last Name)	Simple/composite	false	Characters (200), not null/ (Characters (200), not null, Characters (200), not null)
	Address (street name, street number, postal code)	Simple/composite	false	Characters (200), not null/ (Characters (200) not null, integer min 1 not null, integer min 1 not null)
PATIENT	Unique ID	Simple	true	Integer min 1, not null
	Name (first	Simple/composi	false	Characters

	Name, Last Name)	te		(200), not null/ (Characters (200), not null, Characters (200), not null)
	Address (street name, street number, postal code)	Simple/composite	false	Characters (200), not null/ (Characters (200) not null, integer min 1 not null, integer min 1 not null)
	Phone	multi-value	false	Integers [9, 9], not null
	Insurance ID	simple	false	Characters (200), not null
APPOINTMENT	Appointment ID	simple	true	Integer min 1, not null
	Patient ID	Simple	false	Integer min 1, not null
	Nurse ID	Simple	false	Integer min 1, not null
	Physician ID	Simple	false	Integer min 1, not null
	End date	Simple	false	Date, not null
ROOM	Unique number	simple	true	Integer min 1, not null
	type	simple	false	Characters (200), not null
	Availability status	simple	false	Boolean, not null
NURSE	Unique ID	Simple	true	integer min 1, not null
	Name	Simple	false	Characters (200), not null
	position	simple	false	Characters

				(200), not null
MEDICATION	unique ID	simple	true	integer min 1, not null
	code	simple	false	integer min 1, not null
	Name	Simple	false	Characters (200), not null
	brand	simple	false	Characters (200), not null
	description	simple	false	Characters (200), not null
PROCEDURE	unique ID	simple	true	integer min 1, not null
	Name	Simple	false	Characters (200), not null
	cost	simple	false	float (200), not null

1.2 Identifying the relationship between entity sets using the following table template:

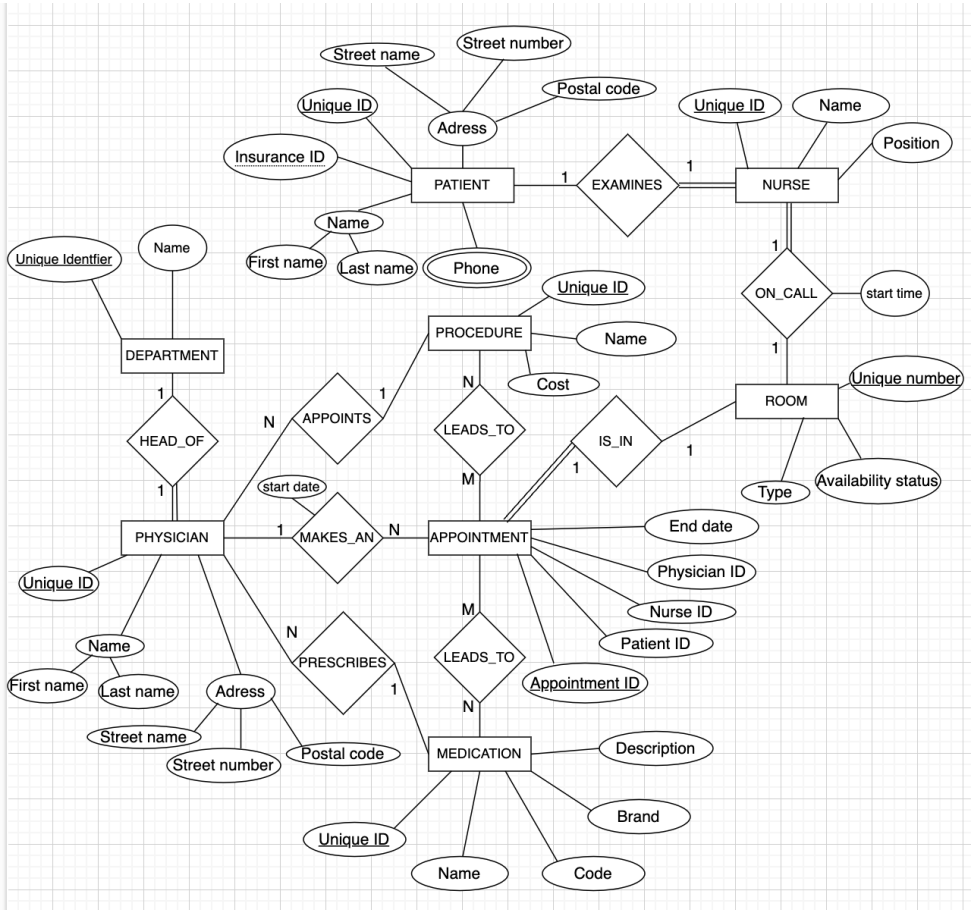
Entity A	Relationship name	Entity B	Cardinality Ration (1:1,1:N,N:1,M:N)	Attribute of Relationship Types	Justify your decision
PHYSICIAN	is head of	DEPARTMENT	1:1	None	Each physician is head of one department.
PHYSICIAN	makes an	APPOINTMENT	1:N	start date	A physician can make several appointments but only one physician for each appointment. The start date for the appointment follows the

					relation.
PHYSICIAN	appoints	PROCEDURE	N:1	None	A physician can only appoint one treatment per appointment, but several physicians can appoint the same treatment.
PHYSICIAN	prescribes	MEDICATION	N:1	None	A physician can only prescribe one medication per appointment, but several physicians can appoint the same treatment.
NURSE	examines	PATIENT	1:1	None	The nurse examines one patient which is only treated by one nurse.
APPOINTMENT	leads to	PROCEDURE	M:N	None	Several appointments can lead to the same treatment and an appointment can lead to several treatments.
APPOINTMENT	is in	ROOM	1:1	None	An appointment can only be in 1 room and each room can only hold 1 appointment.

APPOINTMENT	leads to	MEDICATION	M:N	None	Several appointments can lead to the same medications and an appointment can lead to several medications.
NURSE	on call	ROOM	1:1	start time	a nurse can be on call to a specific examination room. The start date is tracked in the relation.

1.3 Design an ER schema for hospital database based on information provided in task 1, and entities defined in 1.2 with relationships defined in 1.3.

The ER schema should contain entities with their corresponding attributes, key attributes of each entity, relationship types, and their corresponding cardinality ration.



Task 2 Conference Review Database (25 points)

2.1 Identify all entities and their attributes from the description of Conference review database requirements using the following Table template:

Entity	Attribute	Attribute Type	Key Attribute	Value sets of attribute (type, min, max, value, NULL/NOT NULL)
AUTHOR	email	simple	true	characters (200), not null
	Name (first Name, Last Name)	Simple/composite	false	Characters (200), not null/ (Characters (200), not null, Characters (200), not null)
	affiliation	Simple	false	characters (200), not null
	country	Simple	false	characters (50), not null
PAPER	unique identifier	simple	true	characters (200), not null
	title	simple	false	characters (200), not null
	abstract	simple	false	characters (500), not null
	keywords	multivalued	false	characters (50), not null
	year	simple	false	characters [4], not null
	file name/ (name, file format)	simple/composite	false	characters (200), not null/ characters (200), not null, characters [1,10], not null
	review/ (comments / (public, feedback), // rating / (technical merit, readability, originality, relevance))	simple/composite/composite	false	characters (300), four integers [1, 10], not null / characters (300), not null / characters (150), not null, characters (150), not null// four integers [1,10], not null / integer [1,10], not null, integer [1,10], not null, integer [1,10], not null, integer [1,10], not null
	recommendations	simple	false	characters (300), not null

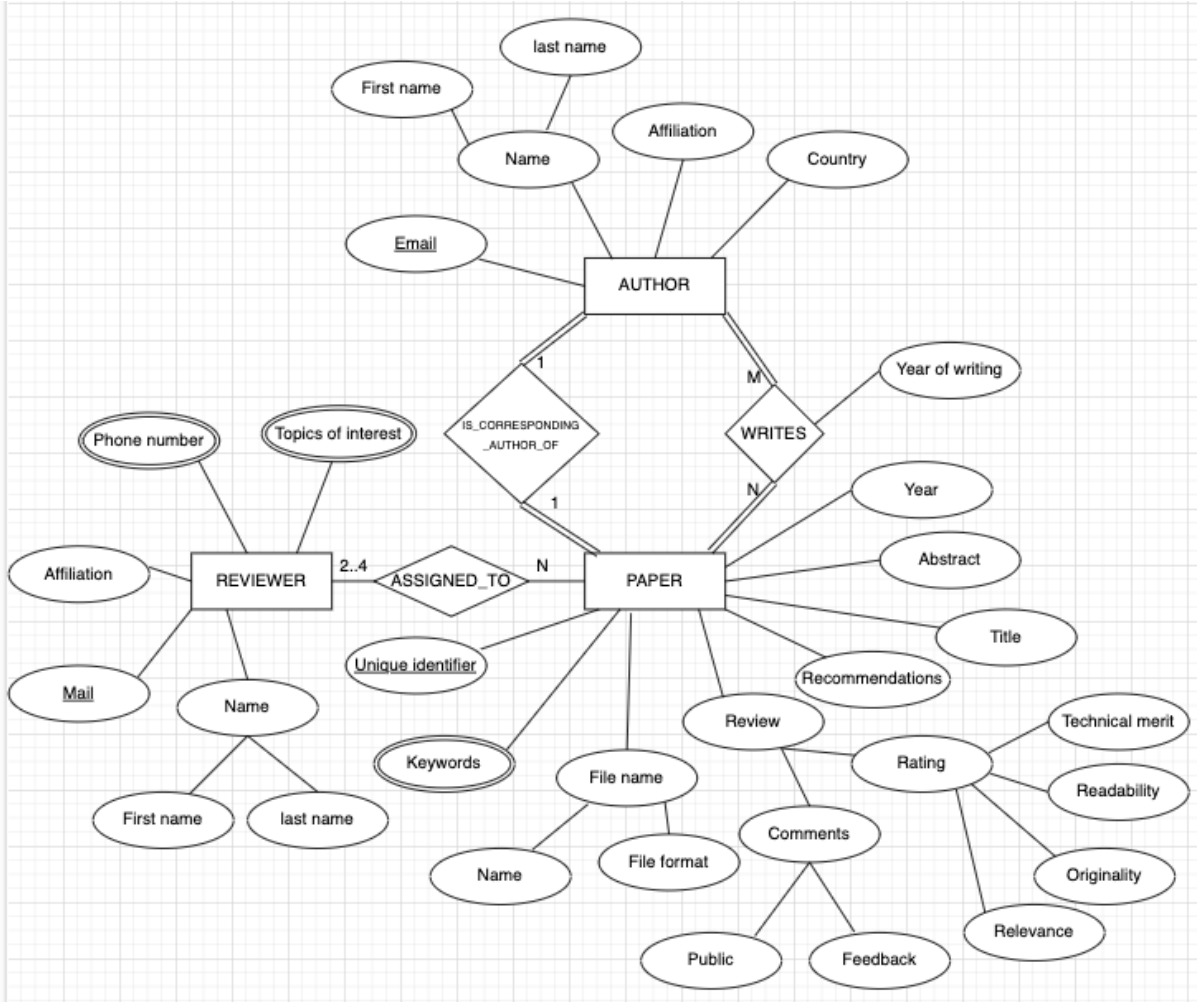
REVIEWER	mail	simple	true	characters (50), not null
	Name / (first Name, Last Name)	Simple/composite	false	Characters (200), not null/ (Characters (200), not null, Characters (200), not null)
	Phone number	multi-value	false	Integers [9, 9], not null
	affiliation	Simple	false	characters (200), not null
	topics of interest	multi-value	false	characters (50), not null

2.2 Identifying the relationship between entity sets using the following table template:

Entity A	Relationship name	Entity B	Cardinality Ration (1:1,1:N,N:1,M:N)	Attribute of Relationship Types	Justify your answer
AUTHOR	writes	PAPER	M:N	year of writing	An author can write several papers and a paper can be written by many authors. The year of writing should also be stored in the relation.
AUTHOR	is corresponding author of	PAPER	1:1		There is only one corresponding author per paper.
REVIEWER	assigned to	PAPER	2..4:N		A paper can only have

					two to four reviewers but a reviwer can review several papers.

2.3 Design an ER schema for review database based on information provided in task 2, and entities defined in 2.1 with relationships defined in 2.2. You are free to make additional assumptions if you feel that some information is missing. Make sure to **document all assumptions** that you make. Please justify your assumptions.



Task 3. Bank database (25 points)

Consider the ER diagram shown below for part of a BANK database. Each bank can have multiple branches, and each branch can have multiple accounts and loans. Provide answers on the following statements:

A. List a strong (nonweak) entity type in the ER diagram

My Answer:

CUSTOMER

B. Is there a weak entity type? If so, give its name, partial key, and identifying relationship

My Answer:

BANK_BRANCH, Branch no, Has_branches.

C. What constraints do the partial key and the identifying relationship of the weak entity type specify in this diagram?

My Answer:

It needs total participation from the bank and Has_branches relationship.

D. List the names of all relationship types and specify the (min,max) constraint and each participation of an entity type in a relationship type. Justify your answer.

Entity name	Relationship name	min,max	Justify your answer
BANK	Has_branches	(1,N)	a bank can have several bank branches related. Must have at least one due to total participation.
BANK_BRANCH	Has_branches	(1,1)	There can only be one bank connected to the bank branch and it has to have at least 1 bank connected to exist according to the total participation.
BANK_BRANCH	Has_Accounts	(0,N)	The bank branch can have several accounts connected to it.
BANK_BRANCH	Loans	(1,N)	a loan in a bank branch must have at least 1 loan connected but the bank branch can have several loans.
ACCOUNT	Has_accounts	(0,1)	The account can only be related to 1 bank branch.
ACCOUNT	A_C	(1,N)	An account can have multiple customers connected to it, but it has to have at least 1.
LOAN	Loans	(0,1)	The loan can only be related to the bank branch via the loan that was taken, and several loans cannot be the same loan as it in that case would be two different loans.
LOAN	L_C	(0,N)	A loan can be done by several customers.
CUSTOMER	A_C	(1,N)	a customer can have several accounts but to exist it must have 1 otherwise the customer does not exist.

CUSTOMER	L_C	(1,N)	The customer can have multiple loans but must have 1 for the loan to exist.

Task 4. Baseball organization database (25 points)

4.1 Identify all superclass entities (with their attributes) and subclasses in the table below:

Superclass	**Attributes**	**Subclass**	**Subclass Attributes**
Players	batting orientation, BA	Pitchers	ERA
League	Name of league, division	Umpire	Unique personal ID, Place of birth, Date of birth, name(first name, last name)
League	Name of league, division	Teams	City, Name, Coaches, Manager
League	Name of league, division	Players	Batting orientation, BA
Teams	City, Name, Coaches, Manager	Home team	None
Teams	City, Name, Coaches, Manager	Visiting team	None
Home team	None	Match	winning pitcher, losing pitcher
Visiting team	None	Match	winning pitcher, losing pitcher
Scores	Errors, Runs, Hits(Singles, Doubles, Triples, Home runs)	Match	winning pitcher, losing pitcher

4.2 Design an enhanced entity-relationship diagram (EER). Provide justification for designed relationships between entities, defined superclasses, and subclasses.

You are free to make additional assumptions if you feel that some information is missing. Make sure to **document all assumptions** that you make. Please justify your assumptions!