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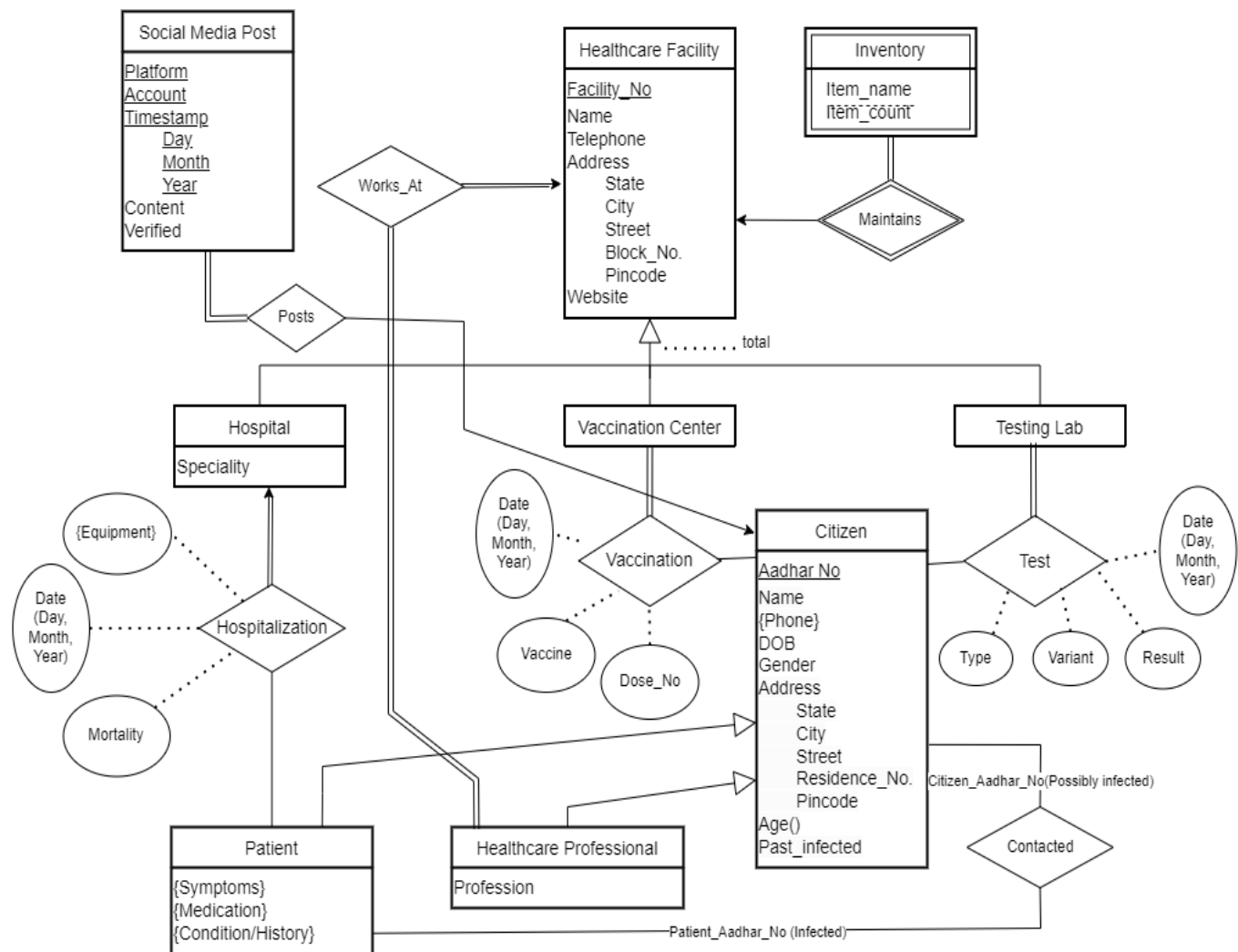
Assignment 1

Spring 2023

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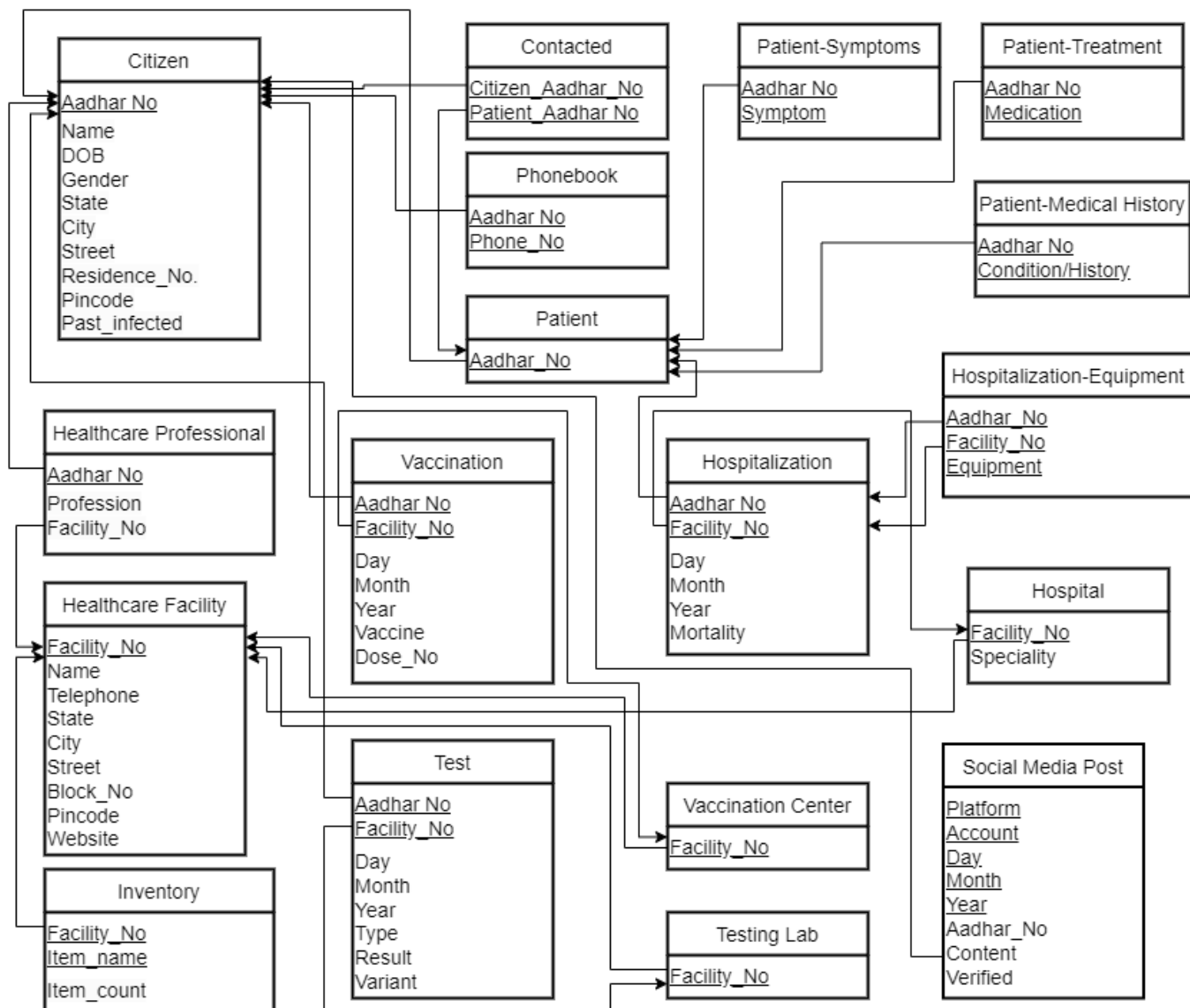
1. Entity-Relationship (ER) Diagram
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# 1. Entity Relationship (ER) Diagram-



## 2. Relational Schema Tables-

- Here, each “box” is a relational table in the final database.
- The contents of the “box” are attributes of the table.
- The Primary Key constraints of each table are underlined.
- The Foreign Key constraints are denoted as: The referenced attribute is at the side of the arrow-head and the referencing attribute is at the other end. Eg: referencing → referenced



[The above diagram follows the notation provided in the book Database Management Systems (Silberschatz, Korth, Sudarshan) 9<sup>th</sup> Edition]

### 3. Database Design Explanation-

Each relation schema, its attributes and uses are described below:

1. Citizen: Stores the data of each citizen, with the following attributes-
    - 1.1. Aadhar\_No: The Aadhar Card no. for each citizen acts as the unique identifier of that person
    - 1.2. Name
    - 1.3. DOB: Date of birth in dd-mm-yyyy format
    - 1.4. Gender: Male / Female / Non-binary
    - 1.5. State, City, Street, Residence\_No, Pincode : Together constitute the address of a person
    - 1.6. Past\_infected: Counts the number of times that person has been affected by Covid (and possibly been cured). 0 if never affected.
  2. Patient: Specialization of entity Citizen, with the following extra attributes-
    - 2.1. Symptoms: The symptoms experienced by the patient, stored in relation Patient-Symptoms (Cough/Fever/Headache)
    - 2.2. Medication: The current medication the patient is taking, stored in the relation Patient-Treatment (Names of medicines/injections)
    - 2.3. Condition/History: A record of the patient's medical history that might affect recovery and type of treatment, stored in relation Patient-Medical History (Stroke/Cardiac issues/Past surgeries)
- [The entity Patient has 3 multivalued attributes, so there is a need to maintain 3 tables, one for each attribute, as mentioned above]
3. Healthcare Professional: Specialization of entity Citizen, with extra attribute-
    - 3.1. Profession: What profession does the individual engage in (Doctor/Nurse/Lab Assistant)

[The entity Healthcare Professional has only 1 relationship set – Works\_At that it participates in. Now, we could have built 2 tables, one for Healthcare Professional and one for Works\_At, but it would lead to a lot of redundancy, so both tables have been merged to form 1 table : Healthcare Professional, that now contains the Facility\_No where they are employed]

4. Healthcare Facility: A list of healthcare facilities with the attributes-
  - 4.1. Facility\_No: The unique identifier given to each facility
  - 4.2. Name
  - 4.3. Telephone: Contact number
  - 4.4. State, City, Street, Block\_No, Pincode: Address of the facility
  - 4.5. Website: For online information
5. Inventory: Each healthcare facility maintains multiple inventories, each of which consists of a tuple of attributes-
  - 5.1. Item\_name: Name of the item stored (Masks/Syringes/Beds/PPE kits/Ventilators/Drips)
  - 5.2. Item\_count: Count of the item stored

[Inventories do not exist independently of their identifying healthcare facilities. Also, they are represented in an all-in-one relation schema that stores the facility name against the item name and count, where the facility can be either a Hospital, Vaccination Centre or a Testing Lab]

6. Hospital: Specialization of entity Healthcare Facility, with extra attribute-
  - 6.1. Speciality: What field / treatment does the hospital specialize in (Cardic/Orthopedic/Gynec/General/Multispeciality)
7. Hospitalization: Each hospitalization event is recorded in this schema, with the following attributes-
  - 7.1. Aadhar\_No: ID of patient hospitalized
  - 7.2. Facility\_No: ID of hospital
  - 7.3. Day, Month, Year: Date in dd-mm-yyyy format
  - 7.4. Mortality: No/Yes based on whether the patient survived or not, respectively (to track number of deaths)
8. Hospitalization\_Equipment: Since each hospitalization event involves the usage of different kinds of equipment, it is modelled as multiavaled variable and stored in a separate schema with attributes-
  - 8.1. Aadhar\_No: Patient ID for whom equipment was used
  - 8.2. Facility\_ID: Hospital ID that used this equipment
  - 8.3. Equipment: Name of the equipment itself

9. Vaccination Centre: Specialization of entity Healthcare Facility, no extra attributes

10. Vaccination: Each vaccination event is recorded in this schema, with the following attributes-

- 10.1. Aadhar\_No: ID of citizen vaccinated
- 10.2. Facility\_No: ID of vaccination centre
- 10.3. Day, Month, Year: Date in dd-mm-yyyy format
- 10.4. Vaccine: Name of vaccine used  
(Covishield/Covaxin/Sputnik/Pfizer)
- 10.5. Dose\_No: The number of times the citizen gets vaccinated for  
(1<sup>st</sup>/2<sup>nd</sup>/Booster)

11. Testing Lab: Specialization of entity Healthcare Facility, no extra attributes

12. Test: Each lab test event is recorded in this schema, with the following attributes

- 12.1. Aadhar\_No: ID of citizen tested
- 12.2. Facility\_No: ID of testing lab
- 12.3. Day, Month, Year: Date in dd-mm-yyyy format
- 12.4. Type: Type of lab test conducted (Rapid/RTPCR)
- 12.5. Result: Positive/ Negative
- 12.6. Variant: Variant of coronavirus detected (if result is positive) /  
NULL (if result is negative) (eg. Omicron/Delta/Alpha)

[Hospital, Vaccination Centre and Testing Lab each have different relationship sets with very distinct and important purposes, so even though most attributes of the facilities do not differ, creating separate entities (and hence relation schemas) for them is crucial]

13. Phonebook: Contains Aadhar\_No and contact number of each person  
(necessary, since each person might have multiple contact numbers)

14. Contacted: For the purpose of contact tracing to test / isolate citizens who were in recent proximity of a patient who tested positive, with the attributes- Patient\_Aadhar\_No and Citizen\_Aadhar\_No (usage is obvious)

[Assume contact in the past 1 or 2 days as reported by patient]

15. Social Media Post: A relation schema to record relevant social media posts. Since social media is an important, yet sometimes inaccurate source of information, so we store only relevant social media posts in a separate table, because we cannot trust it enough to make direct changes in our database, nor disregard it completely to avoid losing out on important information. We store the attributes-

- 15.1. Platform: Which online platform the post was posted on
- 15.2. Account: Account name
- 15.3. Day, Month, Year: Date in dd-mm-yyyy format
- 15.4. Aadhar\_No: Aadhar\_No of the user the account belongs to
- 15.5. Content: Important content from the post may be extracted using other methods (outside the scope of our current discussion) and stored as a string (or pictures, etc.) in this field
- 15.6. Verified: Yes/ No based on whether a verified user makes this post

[Here, we could have made 2 relation schemas instead of one, “social media post” and “posts” to store the post itself and to map the post to the user’s Aadhar ID, but merging them into one table eliminates this redundancy]

Q) Why is “Government Agency” NOT made an entity here?

A) Govt. Agencies USE this data to draw conclusions and be prepared in the future for supplying resources. They do not ADD data to this database. So, no action of Govt. Agencies needs to be stored, whatsoever. Hence, it is not useful to make Govt. Agencies an entity / relation in this system [though they can still be given full access to all data in this database which serves the purpose]