DBMS LAB
Assignment -1
E-R Diagram and Schema

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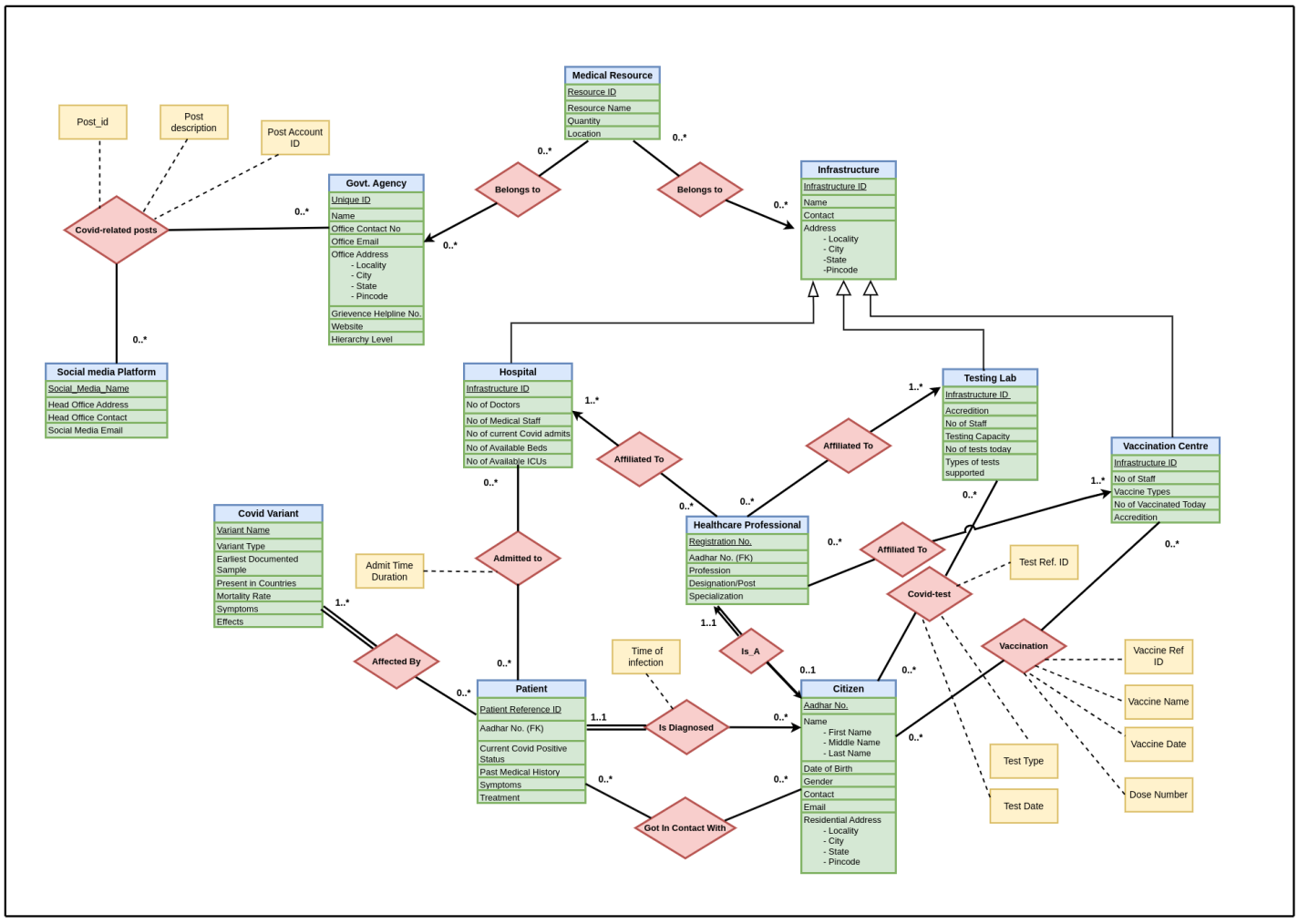
E-R diagram:



Drive_link of my E-R diagram:
https://drive.google.com/drive/folders/1uPkC5udTvhQzN6OLF6NHB0bTAQ9D02Pv?usp=sharing

(A) Entities along with their attributes:

1.) Citizen:

citizen(aadhar_no, first_name, middle_name, last_name, date_of_birth, gender, contact no, email, locality, city, state, pin code)

Primary_Key: aadhar_no. (unique for each citizen entity)

- A citizen entity is a reference to a citizen of a country/state for which the Covid-management system is employed.
- The citizen is uniquely identifiable by his Aadhar number. Apart, from this, the other attributes of the citizen are name, date of birth, gender, contact no, address, etc.

2.) Patient:

patient(patient_reference_id, aadhar no., current_covid_positive_status, past_medical_history, symptoms, treatment)

Primary_Key: patient_reference_id
Foreign_Key: aadhar_no.

- A patient entity addresses a citizen who is affected from covid, and the entity has patient_reference_id as the primary key. Note that even for the same citizen, if she suffers from covid multiple times, each time a different patient entity would be created for her, with a corresponding unique patient_reference_no.
- The patient also has attributes aadhar no. (pointing to the citizen corresponding to the patient entity), current covid positive status - a descriptive text attribute (whether she is currently covid-positive or not, or has symptoms but is not covid- positive, past_medical_history (a discriptive text attribute), symptoms (multi-valued attribute), and current line of treatment (a discriptive text attribute).

3.) Healthcare Professional:

Healthcare_professional (registration no. , aadhar_no, profession, designation/post, specialization)

Primary_Key: registration_no
Foreign_Key: aadhar_no

- A healthcare_professional is an entity to represent all the people working in the health-care profession and involved in providing medical assistance in a pandemic. These include doctors, nurses, compounders, people working in testing centres, etc. Also, note that a doctor and a nurse, or a doctor and compounder, or a nurse and compounder cannot have the same registration_no.
- Each healthcare_professional has a unique registration-id provided to them by a country/state's medical council and it uniquely identifies each healthcare professional.
- Aadhar_no is a foreign-key for its one-to-one relation with the citizen entity as each healthcare professional is a citizen.
- Profession attribute can take values like 'Doctor'/'Nurse'/'Compounder', etc to differentiate the various types of healthcare professionals.
- Designation/Post is attribute at what position the healthcare worker is in the institute/organization she is affiliated to. The Specialization attribute can specify , for example the specialization of a doctor (like pulmonologist, cardiologist, etc.) or the specialisation of a nurse.

4.) Govt. agency:

government_agency(unique_id, name, office_contact_no,office_email_address, office-address, grievence_helpline_no, website, hierarchy_level)

Primary_Key: unique_id

- Government agency entity represents the various governmental organisations at the global, national, state and district levels involved in management and control of pandemic. Examples are WHO(global level), MoHFW (national level), state and district level govt. Health organisations, etc.

- Each such agency involved has a unique id as primary key. The agency name, office contact no, office email, office address , helpline no, website are some other attributes.
- The ‘hierarchy’ attribute represents the jurisdiction level/governence level of the agency, for example if it is a global/national/state/district level agency.

5.) Social media platform:

social_media_platform(social_media_name, head_office_address, head_office_contact, email)

Primary key: social_media_name

- A social media entity represents different platforms like WhatsApp, Facebook, etc. through which different govt. agencies can post info related to pandemic and precautionary guidelines.
- With social_media_name as primary key, other attributes are the address of the Headquarters of the social media, Headquarter contact no, etc.

6.) Covid Variant:

covid_variant(variant_name, variant_type, earliest_documented_sample, present_in_countries, mortality_rate, symptoms, effects)

Primary key: variant_name

- Variant_name (like Alpha, Omicron, Delta, etc.) form Primary key. Variant type has categories like Variant of Concern (VOC), Variant of Interest(VOI) decided by WHO. Earliest documented sample is a multi-valued attribute holding the date and country of earliest sample, ‘present_in_countries’ is a multi-valued attribute which lists the countries where the particular variant is present.
- Symptoms and effects are descriptive attributes and self-explanatatory.

7.) Medical Resource:

medical_resource(resource_id, resource_name, quantity, location)

Primary_key: resource_id

- Medical_resource entity represents medical resources such as Oxygen cylinders, no of ambulances, ventilators, PPE kits, beds, testing kits, vaccines, etc which may be available in a organisation, such as a hospitals, vaccine centres, or with govt. agencies, etc.
- Each resource corresponding to an organisation has a unique resource no. (i.e, two different organisations , say two different hospitals will have two different resource id even for the same resource, say oxygen cylinders)
- Resource_name refers to what the resource is -> for example, oxygen cylinders, PPE kits, ventilators, etc, and quantity is the currently available amount of that resource. Location is the place where the resource is kept

8.) Infrastructure :

infrastructure(infrastructure_id, name, contact_no, address)

Primary key: infrastructure_id

- The entity Infrastructure represents medical centres such as hospitals/ dispensaries, vaccine and testing centres. Each has a unique Infrastructure key to distinguish it from others.
- Other attributes are name of the medical infrastructure, its contact no and the composite attribute address (locality, city, state, pincode)

The entity infrastructure has 3 specialised entity classes:

8.1) Hospitals :

hospital(infrastructure_id, no_of_doctors, no_of_medical_staff, no_of current_covid_admits, no_of_available_beds, no_of_available_ICUs)

Primary key: infrastructure_id

- Since hospital is a specialisation of infrastructure, it has the same primary key. Other attributes are self explanatory.

8.2) Testing Labs:

testing_lab(infrastructure_id, accredition, no_of_staff, testing_capacity, test_types, no_of_tests_today)

Primary Key: infrastructure_id

- Since testing_lab is a specialisation of infrastructure, it has the same primary key. Accredition attribute refers to the organisation which has officially recognised the testing lab, for example it can take the value ICMR (Indian Council of Medical Research) if a lab has been accredited by the ICMR. Types of tests is multi-valued and can have values like RTPCR, RAT, etc.

8.3) Vaccine centres:

vaccine_centre(infrastructure_id, no_of_staff, vaccine_types, no_of_patients_vaccinated_today, accredition)

Primary key:infrastructure_id

- Since vaccine_centre is a specialisation of infrastructure, it has the same primary key. Other attributes are self-explanatory.

(B) Relations among entities :

1.) is_diagnosed (b/w citizen and patient)

- The relation represents that a citizen when diagnosed with covid relates to a patient entity corresponing to it. If the same person gets covid multiple times, there will be different patient entities in the database for the same citizen for the different times he caught covid. Therefore , it is a **one-to-many** relation from citizen to patient, with **total participation** of patient.

Schema: **is_diagnosed**(aadhar_no, patient_reference_id, time_of_infection)

- The patient_reference_id is the primary key of the relation as it would be unique for each instance of the relation. Note that aadhar_no can’t be a primary key

alone since there could be multiple patient entities for the same citizen if she got infected multiple times. For each such patient entity the patient reference id would be unique, even if the patient corresponds to the same citizen.
- Has attribute '**time_of_infection**' to capture the time duration for which citizen was covid-patient.

2.) got_in_contact_with (b/w citizen and patient)

- The relationship represents the citizens who came in contact with a covid patient-> useful for contact-tracing. The citizen is the person who got in contact with the patient.
- **Many-to-many** relation

Schema: **got_in_contact_with**(aadhar_no, patient_reference_id)

- Patient_reference_id is the primary key for this relation.

3.) affected_by (b/w patient and covid_variant)

- This relation depicts the covid variant by which a patient is infected. It is a **many-to-many** relation, as a patient may be simultaneously infected by > 1 variants, and multiple patients can be infected by the same variant.
- **Total participation** of covid_variant as each variant has atleast one patient infected by it. Patient_ref_id is primary key.

Schema: **affected_by**(patient_ref_id, variant_name)

4.) admitted_to (b/w patient and hospital)

- **Many_to_many** relation as many patients can be admitted to the same hospital at a time, and a patient can be admitted to different hospitals at different times.
- '**Admit_time_duration'** attribute is a multi-valued attribute that stores the admit and discharge dates of patient.
- **patient_ref_id, infra_id, admit_time_duration** together form the **primary key** as a patient may be admitted to different hospitals during different time-periods and even the same hospital during different time periods.

Schema: **admitted_to**(patient_ref_id, infra_id, admit_time_duration)

5.) is_a (b/w healthcare professional and citizen)

- **One -to-one relation** with **total participation of healthcare professional entity set. 'Aadhar no.'** attribute of the citizen is **primary key**.

- A citizen is related to a healthcare professional if he is a healthcare professional and each healthcare professional must be a citizen.

Schema: **is_a(**registration_no., aadhar_no.)

6.) vaccination (b/w citizen and vaccine centre)

- Relation states that a citizen is related to a vaccine centre if he took a covid vaccine there. **Many-to-many relation** as many citizens can take jabs at same centre and one citizen can take jabs at many different centres.
- Attribute **'Vaccine_ref_id'** is the **primary key** as it is uniquely generated each time a citizen takes a vaccine dose. It is different for different dozes of the same citizen as well as different across different citizens.
- Vaccine name attribute stores the name of vaccine taken by a patient. Vaccine date stores the date on which a patient was vaccinated.

Schema: **vaccination**(aadhar_no, infra_id, vaccine_ref_id, vaccine_name, vaccine_date, dose_no)

7.) covid_test (b/w citizen and testing_lab)

- Relation states that a citizen is related to a testing_lab if he got tested there. **Many-to-many relation**(same reason as above).
- Attribute '**Test_ref_id'** is the **primary_key** as it is uniquely generated each time a citizen gets tested. Test_type attribute can take values like RT-PCR, RAT.

Schema: **covid_test**(aadhar_no., infra_id, test_ref_id, test_type, test_date)

8.) affiliated_to (b/w healthcare professional and hospital)

- Relation states that a healthcare professional (for example, a doctor) is related to a hospital if she works in that hospital. It is a **many_to_one** relation as each hospital can have many healthcare professionals but each healthcare professional must belong to only one hospital. Also, each hospital must have atleast one h/c professional.
- **'Registration no'** of the h/c professional is the **primary key** of relation.

Schema: **affiliated_to**(registration no, infra_id)

9.) affiliated_to (b/w healthcare professional and vaccine_centre)

- Relation states that a healthcare professional (like nurse) is related to a vaccine_centre if she works in that vaccine_centre. It is a **many_to_one** relation

(same reason as above).Also, each vaccine_centre must have atleast one h/c professional.

- **‘Registration no’** of the h/c professional is the **primary key** of relation.

Schema: **affiliated_to**(registration no, infra_id)

10.) affiliated_to (b/w healthcare professional and testing_lab)

- Relation states that a healthcare professional(like compounder) is related to a testing_lab if he works in that testing_lab. It is a **many_to_one** relation. Also, each testing_lab must have atleast one h/c professional.
- **‘Registration no’** of the h/c professional is the **primary key** of relation.

Schema: **affiliated_to**(registration no, infra_id)

11.) belongs_to (b/w medical_resource and govt. agency)

- Relation states that a medical_resource is related to an agency if it belongs to that agency. **Many-to-one** relationship from medical resource to govt. agency as a govt. agency can have many resources but each resource belongs to only one govt. agency
- **resource_id** of medical resource is **primary key** of relation.

Schema: **belongs_to**(resource_id, unique_id)

(Note: unique_id is the primary key of govt agency)

12.) belongs_to (b/w medical_resource and infrastructure)

- Relation states that a medical_resource is related to an infrastructure (hospital/ testing lab/ vaccine_centre) if it belongs to that infrastructure. **Many-to-one relationship** from medical resource to govt. agency as a govt. agency can have many resources but each resource belongs to only one govt. agency
- **resource_id** of medical resource is **primary key** of relation.

Schema: **belongs_to**(resource_id, infrastructure_id)

13.) covid_related_posts(b/w social media platform and govt. agency)

- Relation states that a social_media_platform is associated with a govt. agency if the govt. agency shared a covid-related post on that platform. **Many-to-many**

relation as an agency can post on multiple social media platforms, and many agencies can post on the same platform.

- '**Social_media_name'** and '**post_id'** together form the **primary key** for the relation as post_id for is unique for different posts on same platform, but maybe same for some posts on two or more different platforms.
- Explanation of attributed:
  1) 'post_id' attribute: unique id of each post on a social media platform,
  2)'post_description' : descriptive text attribute describing the post content (unstructured data)
  3) 'post_account_id': id of the social media account through which a post was made.

Schema: **covid_related_posts**(social_media_name, post_id, post_description, post_account_id, unique_id,)

(Note: unique_id is the primary key of govt agency)
