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Making database for a Hospital Management System

A database is essential for a hospital as it provides an organized, efficient, and secure way to manage and access large volumes of information, which is crucial in healthcare settings. For making a perfect database we have to follow 5 key steps

Step-1: Identify the entities required

In a Hospital Management System (HMS) database, entities represent the core objects in the system, and attributes define the properties of these entities. Relations describe how these entities are linked to one another. Here's a breakdown of common entities, their attributes, and the relations for a typical hospital management system database:

Entity sets are,

- Patient
- Doctor
- Appointment
- Department
- Nurse
- Laboratory
- Prescription
- Billing
- Treatment

Step-2: Identify the Attributes and Primary key for each Entity

Patients- (id,name,gender,dob,address,phone_no,blood_type)
Doctors- (id,name,speciality,number,email,dept_id,experienced)
Appointment- (id,patient_id,doctor_id,appointment_date,status)
Departments- (id,name,location,doctors,staffs,number,hod)
Nurse- (id,name,roll,number,dept_id)
Laboratory- (id,test_type,result,patient_id,doctor_id)
Prescription- (id,patient_id,doctor_id,date_issued,dosage)
Billing- (id,patient_id,appointment_id,amount,payment_status,date)
Treatment- (id,patient_id,doctor_id,description,start_date,end_date)

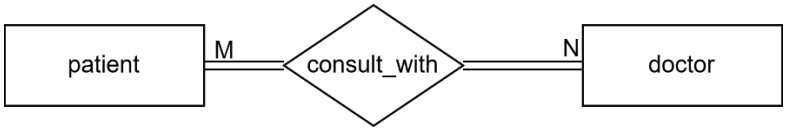
Step-3: Identify the relationship needed

- Patient-consults_with-doctor
- Patient-cared_by-nurse

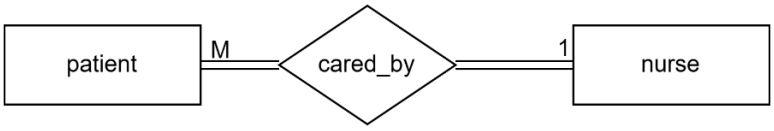
- Doctor-attend-appointment
- Patient-recieves-treatment
- Doctor-gives-treatment
- Doctor-works_in-department
- Nurse-works-department
- Patient-has-prescription
- Billing-billed_for-patient
- Laboratory-test_for-patient

Step-4: Identify the Cardinality Ratio and Participation

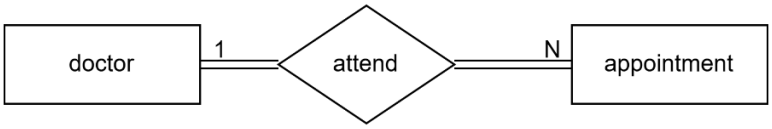
1. Patient-consults_with-doctor



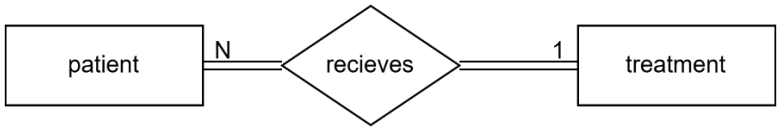
2. Patient-cared_by-nurse



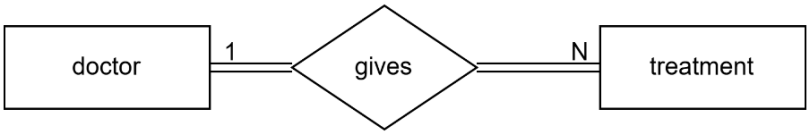
3. Doctor-attend-appointment



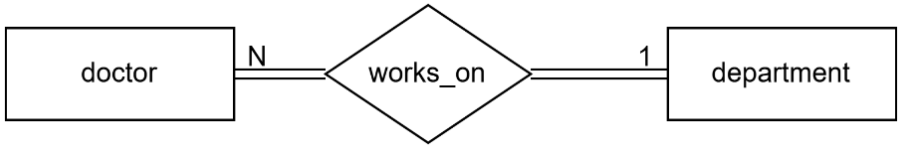
4. Patient-recieves-treatment



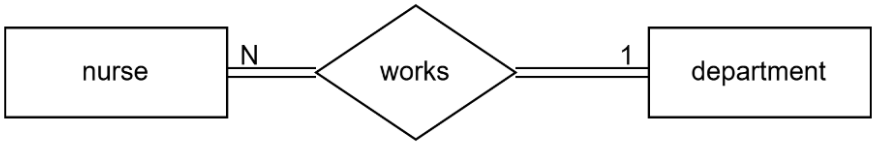
5. Doctor-gives-treatment



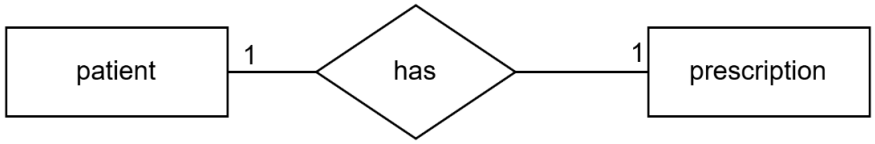
6. Doctor-works_in-department



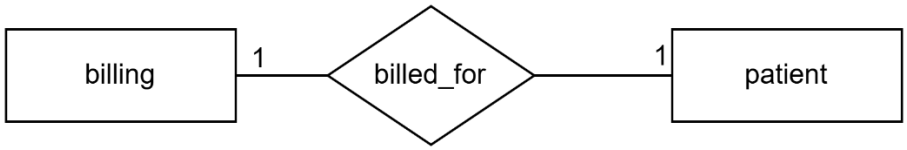
7. Nurse-works-department



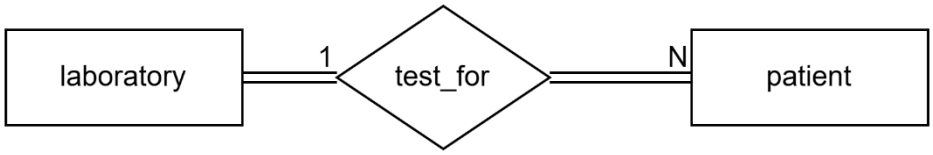
8. Patient-has-prescription



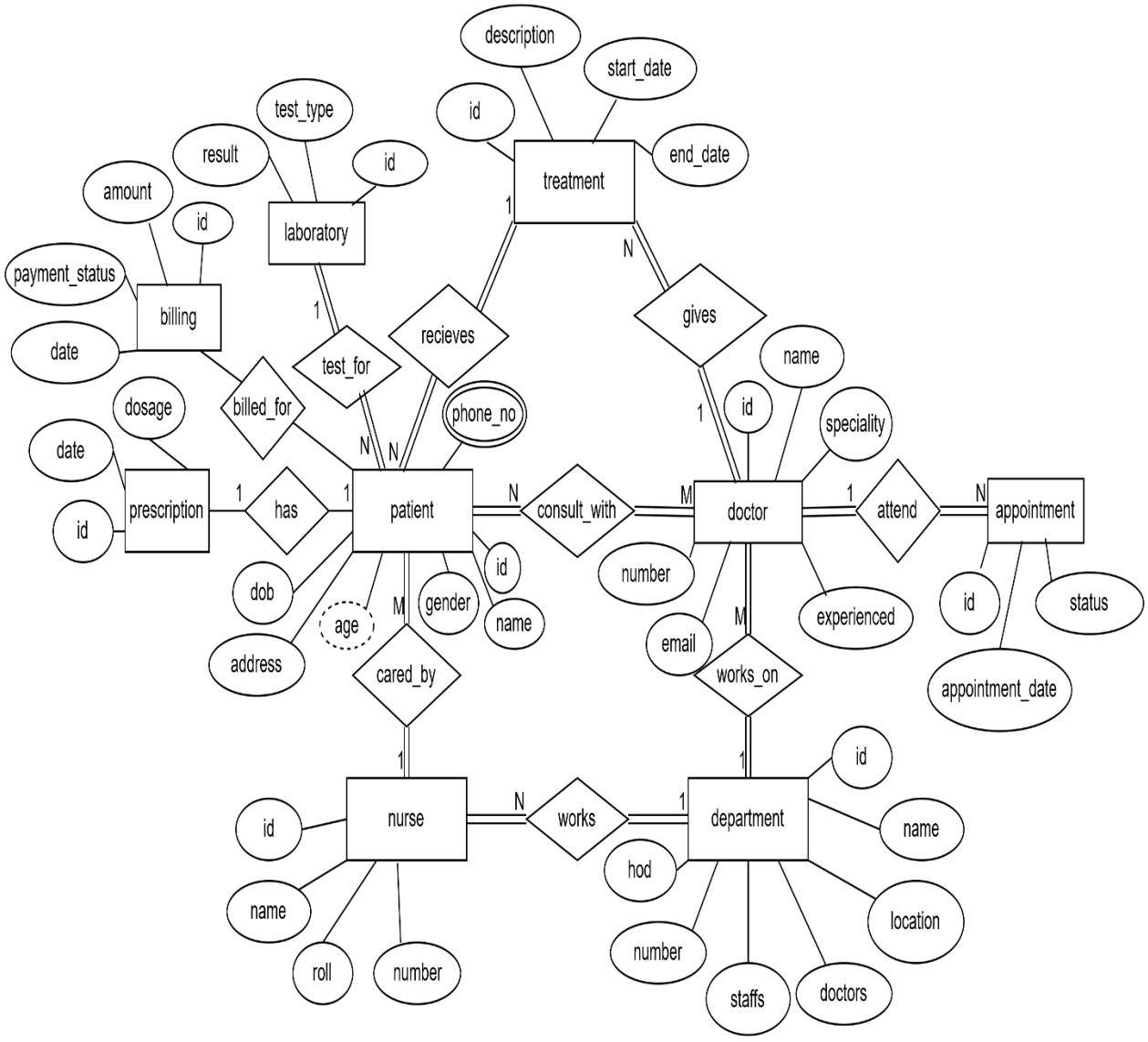
9. Billing-billed_for-patient



10. Laboratory-test_for-patient



Step-5: Draw the Diagram



ER diagram for a Hospital Management System

Step-6: Implementing the database in MySQL:

1. Patients- (id,name,gender,dob,address,phone_no,blood_type)

id	name	gender	dob	address	phone_number	blood_type
1	Sultana Sadia	female	2024-10-09	Narayanganj,Dhaka	017623-34674	O+
2	fahmida akter	female	1997-10-21	RK mission road	012376-7644	B+
3	Rehana Parvin	female	2014-08-18	RN Tower,Maniknagar	01263-374t432	B+
4	Kamrul Hasan	male	1995-10-23	Victoria Garden,Tikatuli	01763-32464	AB+
5	Ahsanul haque	male	2024-10-09	Bels Park,Barishal	0214325-43554	A-
6	Jahangir Alam	male	1990-10-24	College Road,Barishal	02734-24354	B-

2. Doctors- (id,name,speciality,number,email,dept_id,experienced)

id	name	speciality	number	email	experienced	dept_id
2	Shaila Haque	Gynaecology	124354654	ahs@gmail.com	10years	1
3	Kibria Khan	Surgery	89754354	akter@gmail.com	2years	3
4	Zunayed Ahsan	Cardiologist	987864755	ena@yahoo.com	5yr	5
5	Kamrun Nahar	Medicine	534556457	par@gmail.com	7yr	1

3. Appointment- (id,patient_id,doctor_id,appointment_date,status)

id	status	date	patient_id	doctor_id
1	evening schedule	2024-10-08	3	3
2	morning state	2017-10-13	5	2
3	night schedule	2022-10-21	6	5
4	morning state	2024-10-07	2	4
5	evening schedule	2015-10-21	5	3

4. Departments- (id,name,location,doctors,staffs,number,hod)

id	name	locations	doctors	staffs	hod	number
1	Anatomy	3rd floor,academic building	15	50	Khairul Alam	534556457
2	Pediatrics	6th floor,emergency building	20	52	Robayet Amin	89754354
3	Medicine	2nd Floor,academic building 2	23	54	Nazim al azad	534556457
4	Intensive Care Unit(ICU)	3rd floor,east block	12	45	Sahida Khatun	98676455
5	Pathology	4rd floor,west block	10	30	ahmadul kabir	987864755

5. Nurses- (id,name,roll,number,dept_id)

id	name	roll	number	dept_id
1	sahida begum	evening time	124354654	3
2	Rupa Khan	night duty	987864755	4
3	Aporna Roy	morning	987864755	2
4	Eva Hasan	night	54786373	3
5	munia tamanna	morning	32543674	3

6. Laboratory- (id,test_type,result,patient_id,doctor_id)

id	test_type	result	patient_id	doctor_id
1	hemoglobin	high	2	3
2	SARS covid	positive	4	5
3	insulin level	moderate	3	2
4	Glucagon	high	1	4
5	Urine test	low	2	3

7. Prescription- (id,patient_id,doctor_id,date_issued,dosage)

id	date_issued	dosage	patient_id	appointment_id
1	2022-10-18	3times everyday & comes again after 1month	3	4
2	2024-10-10	2times each day & come again after 15 days	5	1
3	2024-10-10	3times everyday after meal	4	1
4	2024-10-20	3times everyday before meal	5	1
5	2024-10-06	3times after meal	1	4

8. Billing- (id,patient_id,appointment_id,amount,payment_status,date)

id	amount	payment_type	date	patient_id	appointment_id
1	50000	bkash	2023-10-15	5	2
2	5600	cash	2024-10-07	3	5
3	23455	credit card	2024-10-07	2	1
4	65780	credit card	2023-12-21	2	4
5	234566	account transer	2024-10-06	1	2

9. Treatment- (id,patient_id,doctor_id,description,start_date,end_date)

id	description	start_date	end_date	patient_id	doctor_id
1	gastric pain	2020-10-03	2024-10-28	5	2
2	heart problem	2024-10-20	2024-10-25	4	2
3	urinary infection	2023-10-27	2024-10-27	3	2
4	hand injury	2022-10-20	2024-10-15	2	4
5	ovarian damage	2019-10-19	2024-07-17	1	5

Databases are an important part of running the entire operations of a hospital, including labs, finances, patient identification, tracking, billing, and payments. Databases are a necessity in hospital management systems because they store and organize critical information that helps healthcare providers make informed decisions, improve patient care, and optimize hospital operations. Database allows for systematic storage and retrieval of patient information, medical records, staff details, and inventory management, ensuring data is organized and accessible. A database can efficiently manage patient records, appointments, and treatments, enabling healthcare providers to track patient histories and improve care quality. With a centralized database, medical staff can access up-to-date information in real time, facilitating better decision-making and coordination of care. A well-designed database can help ensure the security of sensitive health information and compliance with regulations like HIPAA, protecting patient privacy. Databases streamline billing processes, track payments, and manage insurance claims, improving financial management for the hospital.

Thank You