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CS614 Assignment 1 Solution

Fall 2026

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CS614 — Data Warehousing

Assignment No. 1 — Fall 2026 | Sample Solution

Given Relation: HOSPITAL_DATA

PatientID	PatientName	DoctorID	DoctorName	MedicineID	MedicineName	Allergy
P101	Ali Khan	D01	Dr. Ahmed	M01	Paracetamol	Dust
P101	Ali Khan	D01	Dr. Ahmed	M02	Cetirizine	Dust
P102	Sara Ali	D02	Dr. Fatima	M03	Amoxicillin	None
P103	Usman Tariq	D01	Dr. Ahmed	M01	Paracetamol	Pollen
P101	Ali Khan	D02	Dr. Fatima	M02	Cetirizine	Dust

Q1: Primary Key

Primary Key: (PatientID, DoctorID, MedicineID). No single attribute is unique: PatientID repeats (P101 appears three times), DoctorID repeats (D01 appears three times) and MedicineID repeats (M01 and M02 appear twice each). The combination of the three uniquely identifies every row, because each row records one patient visiting one doctor and receiving one medicine.

The key is minimal: dropping PatientID makes rows 1 and 4 identical on (D01, M01); dropping DoctorID makes rows 2 and 5 identical on (P101, M02); dropping MedicineID makes rows 1 and 2 identical on (P101, D01).

Q2: Prime and Non-Prime Attributes

Prime attributes (parts of the primary key): PatientID, DoctorID, MedicineID.

Non-prime attributes (not part of the primary key): PatientName, DoctorName, MedicineName, Allergy.

Q3: Data Redundancy

The same facts are stored again and again because patient, doctor and medicine details are kept in every row instead of in separate tables. For example, Ali Khan's name and his allergy "Dust" are repeated in three rows (once for every doctor and medicine combination), Dr. Ahmed's name is repeated in three rows, and the medicine names Paracetamol and Cetirizine are each repeated in two rows. If Ali Khan's allergy changes, it must be changed in all three rows.

Q4: Anomalies

Insertion:
A new patient who has not yet visited a doctor or received any medicine cannot be added, because DoctorID and MedicineID are part of the primary key and cannot be left empty. Similarly, a new doctor or a new medicine cannot be recorded on its own.

Deletion:
If Sara Ali's only row (P102) is deleted, all information about Sara Ali, including her allergy, is lost with it. Likewise, deleting the only row of Amoxicillin removes the medicine itself from the database.

Update:
If Dr. Ahmed's name or Ali Khan's allergy has to change, the change must be made in all three rows where it appears. If even one row is missed, the same person will have two different names or allergies in the database and the data becomes inconsistent.