BE Computer Engineering
CER4C4 DBMS
Class Test 2 Session February-June, 2021

Duration : 70 Mins. **MM – 20**

Note: All questions are compulsory. Make suitable assumptions, if necessary.

#1 The Aarogyam chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Draw an ER diagram that captures the preceding information. Identify any constraints not captured by the ER diagram.

Here's the information that you gather:

- Patients are identified by an Adhaar ID, and their names, addresses, and ages must be recorded.
- Doctors are identified by an Adhaar ID. For each doctor, the name, specialty, and years of experience must be recorded.
- Each pharmaceutical company is identified by name and has a phone number.
- For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer.
- Each pharmacy has a name, address, and phone number.
- Every patient has a primary physician. Every doctor has at least one patient.
- Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another.
- Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that, if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored.
- Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract.
- Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

#2 Map the above ER diagram to a relational model using the mapping rules. Identify the relational model constraints applicable on it.

#3 Given two relations R1 and R2, where R1 contains N1 tuples, R2 contains N2 tuples, and N2 > N1 > 0, give the minimum and maximum possible sizes (in tuples) for the resulting relation produced by each of the following relational algebra expressions. In each case, state any assumptions about the schemas for R1 and R2 needed to make the expression meaningful:

(i) R1 U R2 (ii) R1 - R2 (iii) R1 x R2 (iv) $\pi a(R1)$ (v) R1/R2

#4 You have the following relational schema contains information about sailors, boats and boats reserved by a sailor on a particular day.

Sailors(<u>sid</u>, sname, rating, age); Boats(<u>bid</u>, bname, colour); Reserves(<u>sid, bid, day</u>).

Write the following queries using relational algebra

a. Find the colours of boats reserved by Shyam.
b. Find the sids of sailors with age over 20 who have not reserved a red boat.
c. Find the names of sailors who have reserved all boats.