

**The LNM Institute of Information Technology****Department of Computer Science and Engineering****IDBMS (CSE 227)****Mid Term Examination**

18 ULS177

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**Time: 90 minutes****Date: 01/10/2019****Max. Marks: 25**

**Instructions:** Answer all questions. Answer in the same order. Change in the order of answering invites a penalty of 2 marks! If there are any assumptions to be made for your answer state clearly the assumption that you are making before answering. Only if the assumption is reasonable it will be considered. No doubt clarifications in the examination hall! All the best!

1. Why would you choose a database system instead of simply storing data in operating system files?  
What is logical data independence and why it is important? **[Marks 4]**

2. Draw an ER diagram that captures the following information: **[Marks 8]**

The Prescriptions-R-X 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. Here's the information that you gather:

- a. Patients are identified by an SSN, and their names, addresses, and ages must be recorded.
- b. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded.
- c. Each pharmaceutical company is identified by name and has a phone number.
- d. 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.
- e. Each pharmacy has a name, address, and phone number.
- f. Every patient has a primary physician. Every doctor has at least one patient.
- g. 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.
- h. 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.
- i. 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.
- j. 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.
- k. 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.

3. A relation R is defined with attributes NAME (unique), STREET, CITY, STATE, and ZIP. Assume that (a) for any given zip code, there is just one city and state; (b) for any given street, city, and state, there is just one zip code. Give a set of FDs for this relation. [Marks 2]

4. Relation R(A, B, C, D, E, F, G, H, I, J) satisfies the following FDs: [Marks 1+1+5]

ABD  $\rightarrow$  E

AB  $\rightarrow$  G

B  $\rightarrow$  F

C  $\rightarrow$  J

J  $\rightarrow$  I

G  $\rightarrow$  H

- a. What are the candidate keys for the relation?  
b. Is the FD, BDG  $\rightarrow$  F implied by this set? Clearly show steps involved.  
c. Decompose R into 2NF and then 3NF relations. Also show whether or not the decompositions into 2NF and 3NF are FD preserving and non loss.
5. Consider the following database that contains information about suppliers, parts and projects. The relation shipment stores details of parts supplied to projects by suppliers. The attribute names in **bold** are the primary key for the respective relation. In SHIPMENTS sno, pno, pjno are also foreign keys that refer to SUPPLIER(sno), PARTS(pno) and PROJECTS(pjno) respectively.

SUPPLIER(**sno**, sName, status, city)

PARTS(**pno**, pName, color, weight, city)

PROJECTS(**pjno**, pjName, city)

SHIPMENTS(**sno**, **pno**, **pjno**, qty)

Write a relational algebra expression to

- a. Retrieve supplier name for suppliers who supply at least one red part.  
b. Retrieve supplier names for suppliers who supply all parts. [Marks 2+2]