1. List four significant differences between a file-processing system and a DBMS.

2. Explain the difference between physical and logical data independence.

3. Construct an E-R diagram for a car-insurance company whose customers own one or more cars each.Each car has associated with it zero to any number of recorded accidents.

4. Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted.

5. Consider the insurance database given below, where the primary keys are underlined. Construct the following relational algebra queries for this relational database.

person (*driver-id#, name, address*)
car (*license, model, year*)
accident (*report-number, date, location*)
owns (*driver-id#, license*)
participated (*driver-id, car, report-number, damage-amount*)

   a) Find the total number of people who owned cars that were involved in accidents in 1989.
   b) Find the number of accidents in which the cars belonging to "John Smith" were involved.
   c) Add a new accident to the database; assume any values for required attributes.
   d) Delete the Mazda belonging to "John Smith".
   e) Update the damage amount for the car with license number "AABB2000" in the accident with report number "AR2197" to $3000.

6. Consider the relational database given above. Give an expression in the relational algebra for each
request:
   a) Modify the database so that Jones now lives in Newtown.
   b) Give all employees of First Bank Corporation a 10 percent salary raise.
   c) Give all managers in this database a 10 percent salary raise.
   d) Give allmanagers in this database a 10 percent salary raise, unless the salary would be greater than $100,000. In such cases, give only a 3 percent raise.
   e) Delete all tuples in the *works* relation for employees of Small Bank Corporation.

7.Let $R = (A, B, C)$, and let $r1$ and $r2$ both be relations on schema R. Give an expression in the domain relational calculus that is equivalent to each of the following:
   a) $\Pi A(r1)$
   b) $\sigma B =17 (r1)$
   c) $r1 \cup r2$
   d) $r1 \cap r2$

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e) $r1 - r2$

8. Consider the insurance database given below, where the primary keys are underlined. Construct the following SQL queries for this relational database.

person (*driver-id#*, *name*, *address*)
car (*license*, *model*, *year*)
accident (*report-number*, *date*, *location*)
owns (*driver-id#*, *license*)
participated (*driver-id*, *car*, *report-number*, *damage-amount*)

      a) Find the total number of people who owned cars that were involved in accidents in 1989.

      b) Find the number of accidents in which the cars belonging to "John Smith" were involved.

      c) Add a new accident to the database; assume any values for required attributes.

      d) Delete the Mazda belonging to "John Smith".

9. The schema $R = (A, B, C, D, E)$ is given. Give a lossless-join decomposition into BCNF of schema R.

$A \rightarrow BC$
$CD \rightarrow E$
$B \rightarrow D$
$E \rightarrow A$

10. List the ACID properties of transaction. Explain the usefulness of each.

11. Explain the distinction between the terms *serial schedule* and *serializable schedule*.

12. What is a recoverable schedule? Why is recoverability of schedules desirable? Are there any circumstances under which it would be desirable to allow nonrecoverable schedules? Explain your answer.

13. What is a cascadeless schedule? Why is cascadelessness of schedules desirable?

14. Show that the two-phase locking protocol ensures conflict serializability, and that transactions can be serialized according to their lock points.

15. What benefit does strict two-phase locking provide? What disadvantages result?

16. What are the states of transaction?

17. What are the two types of serializability?

18. Define lock. What are the different modes of lock?

19. Define deadlock.

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20. Explain the different normal forms in detail
      a) 1 normal form
      b) 2 nd normal form
      c) 3 rd normal form
      d) BCNF

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