final exam paper

course name__database principle__examination time__95minutes__

student number_____student name_____

1. How does the modern database system realize the independence of data? In database design, is the higher the NF(Normal Form) that the data schema follows, the better? (12)

2. A hotel needs to establish a housing management system, and the demand analysis structure is as follows:
   a) A room has more than one bed, each room has room number (such as 201, 202, etc.), charge standard, number of beds and other information;
   b) Guest information includes ID number, name, gender, address and other information;
   c) For each stay of each guest, the check-in date, check-out date and prepayment information shall be recorded.
   According to demand analysis, the designed relational data model is as follows:
   Room (room number, charge standard, number of beds)
   Guest (ID number, name, gender, date of birth, address)
   Accommodation (room number, ID number, check-in date, check-out date, prepayment)
   Assuming that the person who booked the room is the person who checked in, please give all primary keys and foreign keys that exist in the above three relational schemas. (12)

3. For the three relational schemas in the above application scenario, write SQL statements that express the following query requirements (must be expressed in a single SQL statement):
   (1) Use join query to find the name of the guest who booked room 210; (8)
   (2) Query the name of the guest who booked all rooms; (8)
   (3) Query the room number and guest name booked by only one person in January 2016; (8)
   (4) For guests who have booked a room more than 60 times, query the maximum number of room bookings per guest in a single month and the year and month corresponding to the maximum number. (10)
   Note: The functions for obtaining the year and month of Datetime data in SQL are getYear(...) and getMonth(...) respectively.

4. Compared with hierarchical and network database systems, query optimization is more important for relational database systems. Is that right? Why? (12)

5. Read the instructions below and answer questions (1) and (2). Assume that the transactions T1 and T2 corresponding to the two businesses are related to deposit relationship:

Transfer businesses -- T1(A,B, S) , transfers S dollars from account A to account B;

Interest calculation business -- T2, calculating interest for all current accounts (i.e., the original amount is X dollars, which is X*1.2 after interest calculation)

(1) If the interest calculation business is designed to calculate interest on a single account separately, that is, T2(A) calculates interest on account A, and T2(B) calculates interest on account B. Is this scheme correct (3)? Why (6)?

(2) Assume a concurrent scheduling of two transactions T1 and T2 as shown in the following table, introduce **(S, U, X) lock (note: the compatibility matrix is as shown in the figure below)**, if the initial A=100, B= 60, S=20, what is the final result of A and B? (6) Is the concurrent scheduling correct? (3)

T₁(A,B,s)	T₂
Read(A)	
A:=A-s	Read(A)
Write(A)	A:=A*1.2
	Write(A)
	Read(B)
Read(B)	B:=B*1.2
B:=B+s	Write(B)
Write(B)	

	Locks already owned by other transactions		
Lock		S	U	X
request	S	Y	Y	N
	U	Y	Y	Y
	X	N	N	N

6. Try to define a trigger on the accommodation relationship table in question 2 to achieve the following function: For each Insert statement, if the inserted record does not have a check-out date, the operation will be rolled back. (12)