박사과정 자격시험

Database Systems

다음과 같이 3개의 relation들로 구성된 예제 database에 대하여 물음에 답하여라. (문항 I.~III.)

S

S#	SNAME	STATUS	CITY
S1	Smith	20	Beijing
S2	Jones	10	Seoul
S3	Blake	30	Seoul
S4	Clark	20	Beijing
S5	Adams	30	Tokyo

P

P#	PNAME	COLOR	WEIGHT	CITY
P1	Nut	Red	12	Beijing
P2	Bolt	Green	17	Seoul
P3	Screw	Blue	17	Singapore
P4	Screw	Red	14	Beijing
P5	Cam	Blue	12	Seoul
P6	Cog	Red	19	Beijing

SP

S#	P#	QTY
S1	P1	NULL
S1	P2	200
S1	P3	400
S1	P4	200
S1	P5	100
S1	P6	100
S2	P1	300
S2	P2	400
S3	P2	200
S4	P2	200
S4	P4	300
S4	P5	400

I. 다음 SQL문의 결과를 보이시오.
   1) SELECT S#, P# FROM SP WHERE NOT QTY<= 100;
   2) SELECT SP.*, CITY FROM SP, S WHERE SP.S#=S.S#;
   3) SELECT * FROM SP ORDERBY QTY DESC, S#;
   4) SELECT * FROM S LEFT JOIN SP ON S.S#=SP.S#;
   5) SELECT S#, SUM(QTY) FROM S LEFT JOIN SP ON S.S#=SP.S# WHERE STATUS >= 20 GROUP BY S#;

II. I-4)와 5)의 SQL문을 자연어 질의로 표시하여라. (에를 들면 I-1)의 경우 "100 보다 많은 양을 납품한 납품 건의 supplier number(S#)와 part number(P#)들은?"과 같이)

III. I-4)의 SQL문을 outer join을 사용하지 않고 selection, projection, join, union, intersection, difference을 사용하여 SQL문을 작성하시오.

IV. DBMS의 3-layered architecture를 간단히 설명하고 이 architecture와 data independence와의 관계를 밝히시오.

V. JDBC(Java Database Connectivity) 사용의 장점을 간단하게 기술하시오.

1. Explain the following: (30%)
    (1) Primary key
    (2) Data independence
    (3) Referential integrity
    (4) Completeness of the D(database)-schema with respect to the
        F(function)-Schema .
    (5) Completeness of the F-schema with respect to the D-Schema
    (6) Clustering index

2. Using Armstrong's axioms, prove the soundness of the pseudotransitivity
   rule: If A -> B and CB -> D, then AC -> D, where A, B, C, D are sets of
   attributes, and -> is the functional dependency. (15%)

3. The motor-vehicle registration office registers vehicles which consist of cars,
trucks, ships, and submarines. The attributes are vehicle-id, max-depth, fuel,
number-of-seats, number-of-wheels, cargo-space, screw-diameter, speed,
and number-of-floors. Vehicles are classified into land vehicles and water
vehicles. Note that airplanes are aerospace vehicles.
    (1) Design a generalization hierarchy of entities for the motor-vehicle
        registration office. (7%)
    (2) Place attributes at each entity. (7%)
    (3) Specify the coverage property for each hierarchy. (i.e., total or partial,
        exclusive or overlapping) (6%)

4. Construct a B+ -tree for the following set of key values:
    (2, 3, 5, 7, 11, 17, 19, 23, 29, 31)
    Assume that the tree is initially empty and values are added in the
    ascending order. Construct the B+ -tree for the case that the number of
    pointers that will fit in one node is four. Show the tree after each insertion.
    (20 %)

5. Consider a relation scheme PART(P#, PNAME, COLOR, WEIGHT, PRICE). Let |part| = 15000, |part.COLOR| = 30, |D(COLOR)| = 50, s(part) = 40, where D(COLOR) is the domain of COLOR and s(part) is the size of a tuple in part in bytes. For the query

    SELECT PNAME, PRICE

    FROM   PART

    WHERE   COLOR = 'white'

What is the size of an intermediate result after processing the WHERE clause assuming the uniform value distribution and that

    (1) it is not known whether there are white parts? (8%)

    (2) it is known that there are white parts? (7%)