

Databases 2004 – Paper 6 Question 6 (GMB)

(a) [Bookwork] As defined in the lecture notes, the core relational algebra consists of the following five classes of operators:

1. The set-theoretic operators: union, intersection, and difference
2. Selection: $\sigma_{P(\vec{A})}$
3. Projection: $\pi_{\vec{A}}$
4. Products and joins: cartesian product and natural joins
5. Renaming: $\rho_{B/A}$

A perfect answer would in addition to giving some detail of these operators, would also mention the concept of *union compatibility* where appropriate.

(b) This is actually done in the lectures in a slightly simpler form.

$$R \div S = \pi_{A_1 \dots A_n}(R) - (\pi_{A_1 \dots A_n}((\pi_{A_1 \dots A_n}(R) \times S) - R))$$

(c) (i) [Bookwork]

(ii) Assuming that $R = R(A_1 \dots A_n)$ then $\delta(R) = \gamma_{A_1, \dots, A_n}(R)$.

(iii) If R is a set then $\gamma_{A_1, \dots, A_k}(R) = \pi_{A_1, \dots, A_k}(R)$. If R is a bag then γ eliminates the duplicates, whereas π does not. For this reason, γ is sometimes referred to as generalized projection.