2004 Paper 6 Question 6

Databases

(a) Define the operators of the core relational algebra. [5 marks]

(b) Let R be a relation with schema $(A_1, \ldots, A_n, B_1, \ldots, B_m)$ and S be a relation with schema $(B_1, \ldots, B_m)$. The quotient of R and S, written $R \div S$, is the set of tuples t over attributes $(A_1, \ldots, A_n)$ such that for every tuple s in S, the tuple ts (i.e. the concatenation of tuples t and s) is a member of R. Define the quotient operator using the operators of the core relational algebra. [8 marks]

(c) The core relational algebra can be extended with a duplicate elimination operator, and a grouping operator.

(i) Define carefully these two operators. [3 marks]

(ii) Assuming the grouping operator, show how the duplicate elimination operator is, in fact, unnecessary. [2 marks]

(iii) Can the grouping operator be used to define the projection operator? Justify your answer. [2 marks]