2004 Paper 9 Question 9

Database Theory

Consider a database with one binary relation B.

(a) Write programs in stratified Datalog for the following queries:

  (i) Give the set of elements x for which there are fewer than three elements y such that $B(x, y)$. [3 marks]

  (ii) Give the set of elements x such that there is no path (in the graph formed by B) from x back to itself. [3 marks]

  (iii) Give the set of elements x such that $B(x, y)$ for every y. [3 marks]

(b) Which of the queries defined in part (a) is:

  (i) safe? [3 marks]

  (ii) domain independent? [4 marks]

  (iii) monotone? [4 marks]

In each case, justify your answer fully.