Finite Model Theory – Homework 4

May 7, 2018

1   Query Containment

1. (0 points)

    Proofs are optional, except where otherwise stated.

    (a) Indicate all containment or equivalence relationships between the following queries:

    $$
    \begin{aligned}
    Q_1 &= R(x, y) \land R(z, y) \land R(x, u) \\
    Q_2 &= R(x, y) \land R(y, z) \land R(z, u) \\
    Q_3 &= R(x, y) \land R(y, z) \land R(z, x) \\
    Q_4 &= R(x, y)
    \end{aligned}
    $$

    (b) Indicate all containment or equivalence relationships between the following queries:

    $$
    \begin{aligned}
    Q_1 &= R(x, y) \land R(y, z) \land R(z, x) \\
    Q_2 &= R(x, y) \land R(y, z) \land R(z, x) \land x \geq y \\
    Q_3 &= R(x, y) \land R(y, z) \land R(z, x) \land x \leq y \leq z
    \end{aligned}
    $$

    (c) [1] Prove that $Q_1 \equiv Q_2$:

    $$
    \begin{aligned}
    Q_1 &= R(x_1, x_2) \land R(x_2, x_3) \land R(x_3, x_4) \land R(x_4, x_5) \land R(x_5, x_1) \land x_1 \neq x_2 \\
    Q_2 &= R(x_1, x_2) \land R(x_2, x_3) \land R(x_3, x_4) \land R(x_4, x_5) \land R(x_5, x_1) \land x_1 \neq x_3
    \end{aligned}
    $$

References

[1] Y. Amsterdamer, D. Deutch, T. Milo, and V. Tannen. On provenance minimization. In *Proceedings of the 30th ACM SIGMOD-SIGACT-SIGART Symposium on Principles of Database Systems, PODS 2011, June 12-16, 2011, Athens, Greece*, pages 141–152, 2011.