

## Homework 3: due 15:30, 17-May-2016

- (1) **(2 points)** In CQ-EVALUATION both the database DB and the query  $\varphi$  are part of the input. On the other hand, in CQ-EVALUATION<sub>DB</sub> the database DB is fixed. What do you think happens to the complexity of CQ-EVALUATION, when the database DB is the input and the query  $\varphi$  is fixed?
- (2) **(3 points)** Determine which of the following hypergraphs are acyclic.
  - (a)  $\left\{ \{1, 2, 3, 4, 5\}, \{1, 6, 3\}, \{3, 7, 5\}, \{1, 8, 5\} \right\}$ .
  - (b)  $\left\{ \{1, 5, 2, 4, 8\}, \{5, 8, 3, 9, 1\}, \{9, 4, 6, 5, 8\}, \{6, 8, 1\} \right\}$ .
  - (c)  $\left\{ \{8, 5, 3, 6\}, \{1, 0, 9, 5\}, \{3, 1, 4, 9\}, \{6, 2, 5, 3, 9\} \right\}$ .
- (3) **(3 points)** Determine the ghw of the hypergraphs in question (2).
- (4) **(3 points)** Describe an algorithm that on input *acyclic* hypergraph  $\mathcal{H}$ , construct its GHDs.
- (5) **(9 points)** Consider the following query:

$$C(x_1, \dots, x_n) \quad := \quad R_1(x_1, x_2) \wedge R_2(x_2, x_3) \wedge \dots \wedge R_{n-1}(x_{n-1}, x_n) \wedge R_n(x_n, x_1)$$

- (a) Determine the ghw of the query  $C(x_1, \dots, x_k)$ .
- (b) Describe how the algorithm<sup>1</sup> explained in Lesson 10 for CQ-EVALUATION<sub>k</sub> evaluates  $C(x_1, \dots, x_n)$  on a given database DB.

What do you think is the major drawback for such approach?

- (c) Can you come up with a better way to evaluate  $C(x_1, \dots, x_n)$ ?

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<sup>1</sup>That is, the algorithm that evaluates queries with bounded ghw.