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Exercise Sheet 8 (Theory)
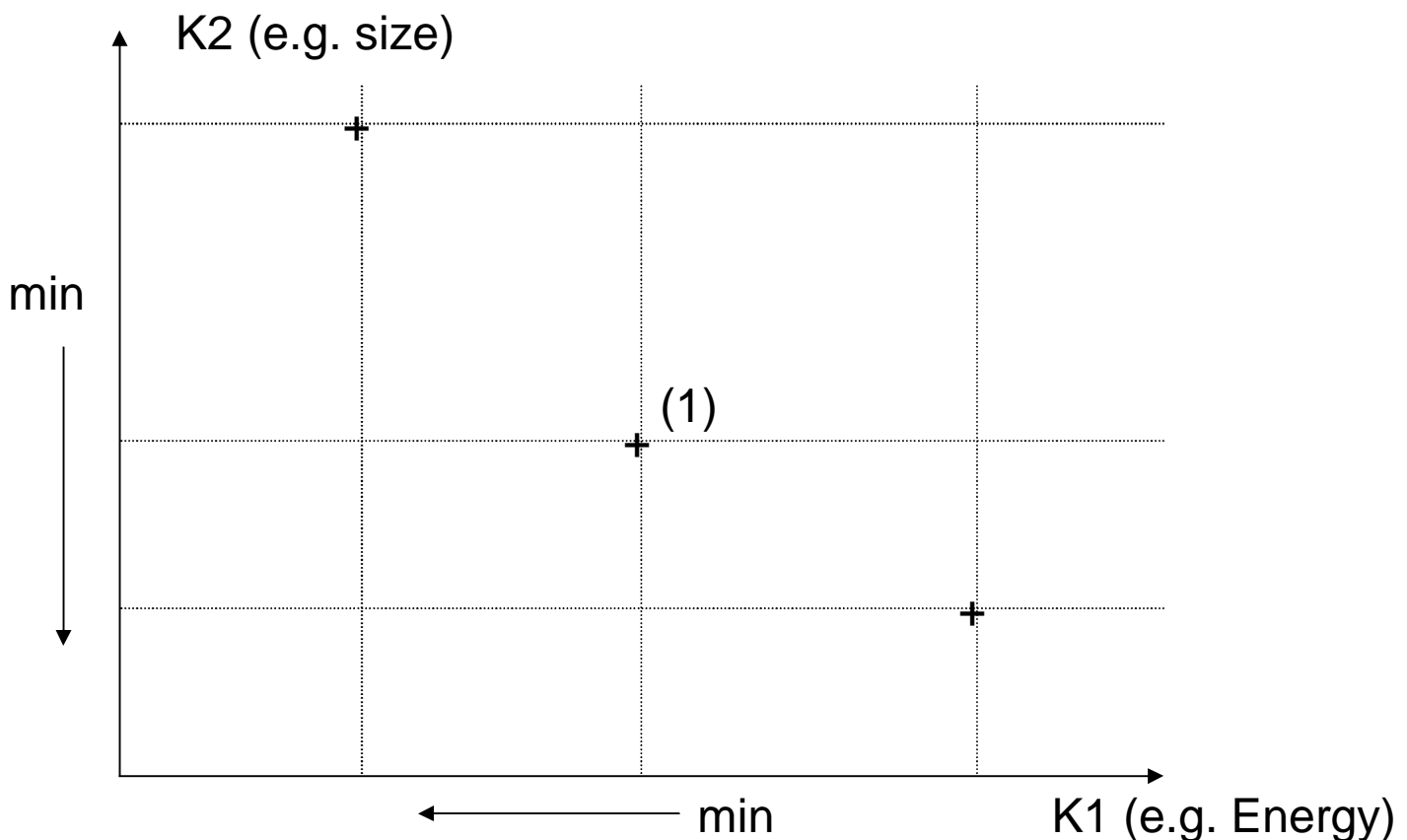### (11 Points)

Please note: Solutions must be submitted (individually or in pairs) until 06.12.2019 at 10:00 AM (mailbox in OH16, ground floor, in front of room E16). Submitting solutions via mail is *not* possible. Discussion: 09.-13.12.2019.

1 Pareto Optimality (1 Point)

Explain in your own words, what the expression *Pareto optimal* means.

2 Pareto Optimization (3 Points)

The following diagram reflects the evaluation of designs with respect to multiple criteria. We assume that we would like to maximize one criteria and minimize the other one. For example, consider an energy harvester to maximize the generated energy with the minimum required space of solar panels or wind wheels. Please indicate the region which is dominated by design (1) (the region in which designs are "inferior" to design (1)). Also, indicate the region in which designs would dominate design (1) (the region in which designs are "superior" to design (1)).

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3   ILP (3 Points)

In addition to the Christmas gifts, Santa Claus wants to pack some food provisions into his sleigh, namely, gingerbread, chocolate and almond biscuits. One piece of gingerbread (25g) keeps him saturated two times as long as one almond cookie (10g), whereas one chocolate bar (100g) keeps him saturated three times as long as one piece of gingerbread. Formulate an ILP to maximize Santa's provisions, which must have a total weight of not more than 10kg.

4   ILP (4 Points)

Assume that a task is either completely executed on an FPGA or on a microprocessor. Further assume that no dependencies exist between tasks. If a task τ_i is executed on the FPGA, it requires B_i configurable logical blocks (CBL) and has an execution time of F_i. If it is executed on a microprocessor, its execution time is C_i. Tasks executed on the microprocessor can only be executed sequentially, while tasks allocated to the FPGA can be executed in parallel. In total, N tasks exist and $F_i < D$ for every task τ_i (i=1,2,..., N).

Formulate this problem as an ILP and explain it. You are not required to solve it.