

Short solutions for Sample Exam 3

“Optimization in Systems and Control” (SC4091)

This document concisely lists the solutions for Sample Exam 3. Note that other solutions might also be correct to some degree, and that

you should extensively motivate your answers in the “real” exam!

(cf. the worked solutions for Sample Exams 1 and 2).

QUESTION 1: Optimization methods I

Short answers for Question 1

- P1. M2 (convex optimization)
- P2. M1 (linear programming)
- P3. multi-run M10 (integer optimization)
- P4. M2 (in fact quadratic programming, but the modified simplex algorithm is not in the list, so M2 is the best choice from the given list of algorithms)
- P5. multi-start M5 (nonlinear/non-convex, gradient and Hessian are very time-consuming to compute)
- P6. M1 (linear programming)
- P7. multi-start M3 (nonlinear/non-convex, gradient and Hessian are easily computable)
- P8. multi-start M3 (after *elimination* a nonlinear/non-convex unconstrained problem is obtained, gradient and Hessian are easily computable)

QUESTION 3

Short answers for Question 3

- a.i) Fill out K in S
- a.ii) Use the fact (or show it) that for transfer functions P and Q , we have $\|PQ\|_{\infty} \leq \|P\|_{\infty} \|Q\|_{\infty}$
- b) First fill out K in R . Next, apply the definition of closed-loop convexity (and use the triangle inequality)