In the name of God

Sharif University of Technology

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Convex Optimization

Homework Nr. 3

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The Simulation results are provided here. Oddly enough, non of the questions would reach a solution with certainty and are extremely dependent on the choice of random matrices that are generated at first, thus, the code is written in such a way to continue generating random matrices until a case is reached in which an answer is achieved for that problem. After reaching a solution, the said matrices are saved for future uses.

Problem 5

The CVX code for part a is simple but due to the random generation of matrices that is mentioned above, the result of the executed code would mostly be that the *status* is *infeasible* and the *optimal value* is $+\infty$. An instance of good matrices is saved and appended and available in the zip file.
The code for part b is implemented in 2 ways; One is the solution provided by the textbook and the other is the less simplified one that I myself have derived. For the matrix set that is generated in part *a*, both these methods, as expected, result in the same optimal value, and the mentioned optimal value is less than the one in part *a* which suggests that there is a gap between the primal and the original problem. With the mentioned matrix, the result of part *a* would be -0.46 whereas the optimal value achieved by part *b* is -2.36.
The question has asked to generate the matrices for different n and compare the consumed *cpu time* but the process of finding matrices that would result in solvable problems is very time consuming and this process could not be completed.

Problem 6

The dual problem of the relative entropy problem is implemented in this section. The problem in this problem is that almost always the *status* would be *unbounded* and the *optimal value* would be $+\infty$. Following the same procedure as the previous section, a set of good matrices are saved and are appended and available in the zip file. For the mentioned set of matrices the optimal value is -0.97442.