FOSSEE Optimization Toolbox Intern Evaluation

Thank you for your interest in FOSSEE Toolbox project. You have expressed interest in the Optimization Toolbox. Before you start working on the toolbox, we would like to assess your coding skills. Please read the details mentioned below.

All questions are compulsory.

A conic problem has conic (nonlinear) constraints in addition to linear objective function and linear constraints. Thus linear optimization is a special case of conic optimization.

ECOS is an open-source solver for computing solutions to conic optimization problems. Its documentation and source code are available online.
https://www.embotech.com/ECOS
https://github.com/embotech/ecos

Q1
Download and install ECOS source code (C API only) and compile the library. You should install it locally in a suitable location. You should get `libecos.a' file. Report the output of executing the 'runecos' binary after the source code of ECOS is compiled.

Q2
Write a C/C++ program to solve a linear optimization problem in 'n' variables. Your program should ask the user to enter an integer value 'n' when prompted, and solve the following problem by calling the ECOS library.

minimize: $x_1 + 3x_2 + 6x_3 + 10x_4 + ... + n*(n+1)/2*x_n$
subject to: $x_1 + x_2 + ... + x_n >= n/2$
$x_1 >= 0$
$x_2 >= 0$
...
$x_n >= 0$

Q3
Write a C/C++ program to solve the following linear optimization problem using ECOS

minimize: c.x
subject to: s <= Ax <= b
l <= x <= u
where A, b, c, l, s, u are given in a user specified input file.

Assume that the first line of the input file has the format: n,m

Here n is the number of variables and m the number of constraints (A matrix is thus mxn in size)

The next line line is of the form:
c1, c2, ..., cn (without line breaks)

The next line line is of the form:
s1, s2, ..., sm (without line breaks)
The next line line is of the form:
b1, b2, ..., bm (without line breaks)
The next line line is of the form:
l1, l2, ..., ln (without line breaks)
The next line line is of the form:
u1, u2, ..., un (without line breaks)
Then we have m lines each containing the rows of A (elements separated by a comma). Your program should print whether the inputs were read correctly, the status returned by ECOS solver, and the optimal values of x.

A sample input file is attached. The code should work for any input file specified by the user.

Code Submission
Failure to follow the steps listed below will lead to your disqualification.

1. Create a **private Bitbucket** repo. The name of the repo should be- (your) **First name Last name- Optimization Toolbox**. Add **fosseeToolbox** as a collaborator to your private repo. **Any repo with public access will be rejected.**

2. Push your code to the repo. Each code should be named according to the question number- for example- Q1.cpp or Q1.c. Add a readme file. The readme file should explain how to execute each question's code. The readme file should include all compiler and loader flags. The readme file should be exhaustive.

3. Create a report for all three questions.
For Q1, report the output of executing the 'runecos' binary after the source code of ECOS is compiled.
For Q2 and Q3, list the output of your code- solver status, optimal values of given variable and function value. If your code returns any other output, include it in your report.
Push the report to your repo.

4. Submit your Bitbucket repo details here- https://goo.gl/forms/7s1POtsYlnYC6tLj2

Code submitted through email will be rejected. Please look at online resources to learn how to use Bitbucket.

If you have any doubts, please email toolbox@scilab.in. Email sent to any other email address will not be answered.

The deadline to submit the Google form is 5 PM, 7 May, 2017. This deadline will be strictly enforced. Emails asking for extensions will be ignored.