

Optimization Methods for Mechanical Design ME7223

Assignment 8

Max marks 10

Due Date: 5 Nov 2020

Instructions

- Answer all questions.
- Write a Matlab program for all the methods mentioned.
- Assume any missing data appropriately and **mention** the values of those parameters wherever applicable.
- Submit the assignment as a *pdf* file with all the graphs included. Caption the graphs appropriately.
- Submit your matlab codes with the function files included (if any).
- Name your **main** matlab files and the gif files in this format: rollnumber_A8_QuestionNo.
Example: me16d411_A8_Q1.m
- Contact the TA (Sri Datta Rapaka) if you have any questions.

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1. Minimize the function given below using *Random search method*: (4)

$$f(x_1, x_2) = x_1^2 + x_2^2 - 6x_1 - 8x_2 + 15$$

subject to

$$\begin{aligned} 4x_1^2 + x_2^2 &\leq 16 \\ 3x_1 + 5x_2 &\leq 15 \\ x_i &\geq 0, \quad i = 1, 2 \end{aligned}$$

Plot the contours of the objective function and superimpose the constraints. Identify the feasible region using the contours of the constraints. Create an animation (*gif* file) to show the progress of the algorithm. Mention the final solution point.

Note: Only show the points in the feasible region that progressively reduce the function value. Choose the missing data appropriately so that the animation is not cluttered with too many points, while being reasonably accurate. Mark the final solution point in a different colour for better readability.

2. Minimize the function given below using *Complex method*: (6)

$$f(x_1, x_2) = (x_1 - 5)^2 + (x_2 - 5)^2$$

subject to

$$\begin{aligned} x_1 + 2x_2 &\leq 15 \\ 1 \leq x_i &\leq 10, \quad i = 1, 2 \end{aligned}$$

Plot the contours of the objective function and superimpose the constraints. Identify the feasible region using the contours of the constraints. Mark the final solution point and mention the corresponding value of the objective function. State clearly all the assumed data.