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% Thomas Satterly
% AAE 550
% HW 1, Part II

% Define known constants

E = 210000000; % kPa
sigma_a = 155000; % kPa
tau_a = 50000; % kPa
rho = 7800; % kg/m^3
w = 1.7; % kN/m
H = 8; % m
P = 5; % kN
do_max = 0.5; % m
do_min = 0.05; % m
di_max = 0.45; % m
di_min = 0.04; % m
dRat_max = 60;
t_max = 0.02; % m
t_min = 0.005; % m
delta_a = 0.1; % m

g1 = @(x) 1 - x(1) / 0.05;
g2 = @(x) x(1) / 0.5 - 1;
g3 = @(x) 1 - x(2) / 0.04;
g4 = @(x) x(2) / 0.45 - 1;
g5 = @(x) ((x(1) + x(2)) / (2 * (x(1) - x(2)))) / 60 - 1;
g6 = @(x) 1 - (x(1) - x(2)) / 0.005;
g7 = @(x) (x(1) - x(2)) / 0.02 - 1;
g8 = @(x) ((16 * (P + w * H) / (pi * (x(1)^4 - x(2)^4))) * ...
    (x(1)^2 + x(1) * x(2) + x(2)^2)) / tau_a - 1;
g9 = @(x) ((32 * (P * H + 0.5 * w * H^2) / (pi * ...
    (x(1)^4 - x(2)^4))) * x(1)) / sigma_a - 1;
g10 = @(x) ((64 / (pi * E * (x(1)^4 - x(2)^4))) * ...
    ((P * H^3) / 3 + (w * H^4) / 8)) / delta_a - 1;

% Define objective function
f = @(x) max(rho * (pi / 4) * (x(1)^2 - x(2)^2) * H, 0);

% Setup constraint equations
gs = {g1, g2, g3, g4, g5, g6, g7, g8, g9, g10};
gsOrig = gs;
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