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% AER E 322 Prelab 8 Spring 2023
% Matthew Mehrtens
% Section 4 Group 2
clear,clc;

% Formula for Moment of Inertia of Specimen 1 & 2
I = @(h, b, t) b * t^3 / 6 + b * t * h^2 / 2 ...
    + t * (h - t)^3 / 12; % [inch^4]

% Formula for r
r = @(OD, t) (OD - t) / 2; % [inch]

% Specimen 1 Parameters
h_1 = 2.43; % [inch]
b_1 = 1.456; % [inch]
t_1 = 0.08; % [inch]
I_1 = I(h_1, b_1, t_1); % [inch^4]

% Specimen 2 Parameters
h_2 = 0.84; % [inch]
b_2 = 0.56; % [inch]
t_2 = 0.055; % [inch]
I_2 = I(h_2, b_2, t_2); % [inch^4]

% Specimen 3 Parameters
t_3 = 0.071; % [inch]
OD_3 = 1.66; % [inch]
theta_0_3 = 3.1 / 2; % [deg]
r_3 = r(OD_3, t_3); % [inch]

% Specimen 4 Parameters
t_4 = 0.071; % [inch]
OD_4 = 1.66; % [inch]
theta_0_4 = 36.3 / 2; % [deg]
r_4 = r(OD_4, t_4); % [inch]

% Specimen 5 Parameters
t_5 = 0.071; % [inch]
OD_5 = 1.66; % [inch]
theta_0_5 = 103.7 / 2; % [deg]
r_5 = r(OD_5, t_5); % [inch]

% Shear center calculations
e_c = @(h, b, t, I) h^2 * b^2 * t / (4 * I); % [inch]
e_circ = @(r, theta_0) 2 * r ...
    * (cosd(theta_0) * (2 * pi - 2 * theta_0) + 2 * sind(theta_0)) ...
    / (2 * pi - 2 * theta_0 + sind(2 * theta_0)); % [inch]

e_1 = e_c(h_1, b_1, t_1, I_1); % [inch]
e_2 = e_c(h_2, b_2, t_2, I_2); % [inch]
e_3 = e_circ(r_3, theta_0_3); % [inch]
e_4 = e_circ(r_4, theta_0_4); % [inch]
e_5 = e_circ(r_5, theta_0_5); % [inch]

% Print output
fprintf("I_1 = %g [inch^4]\n" + ...
    "I_2 = %g [inch^4]\n" + ...
    "e_1 = %g [inch]\n" + ...
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```
    "e_2 = %g [inch]\n" + ...
    "e_3 = %g [inch]\n" + ...
    "e_4 = %g [inch]\n" + ...
    "e_5 = %g [inch]\n", ...
    [I_1, I_2, e_1, e_2, e_3, e_4, e_5]);
```