MAIN FUNCTION FILE

%% A function to calculate: the percentage error and new error limit (15%)

%% Defining the primary function

function [percentage\_error, new\_error\_limit] = measurementResults(R\_val, Ac\_val, Pc\_val, r\_err, ac\_err, pc\_err, Err\_lim, n)

% Calculating percentage error

percentage\_error = calculatePercentageError(R\_val, Ac\_val, Pc\_val, r\_err, ac\_err, pc\_err);

% Calculating new error limit (15%)

new\_error\_limit = calculateNewErrorLimit(R\_val, Ac\_val, Pc\_val, Err\_lim, n);

end

%% Local function to calculate the percentage error

function resultsPercentageError = calculatePercentageError(R\_val, Ac\_val, Pc\_val, r\_err, ac\_err, pc\_err)

% Defining the symbolic variables and function

syms R\_sym Ac\_sym Pc\_sym

L\_sym = (R\_sym \* Ac\_sym) / Pc\_sym;

% Differentiating L with respect to each variable

DL\_DR\_sym = diff(L\_sym, R\_sym);

DL\_DAc\_sym = diff(L\_sym, Ac\_sym);

DL\_DPc\_sym = diff(L\_sym, Pc\_sym);

% Substituting the actual values into L and its derivatives

L = double(subs(L\_sym, [R\_sym, Ac\_sym, Pc\_sym], [R\_val, Ac\_val, Pc\_val]));

result\_R = double(subs(DL\_DR\_sym, [R\_sym, Ac\_sym, Pc\_sym], [R\_val, Ac\_val, Pc\_val]));

result\_Ac = double(subs(DL\_DAc\_sym, [R\_sym, Ac\_sym, Pc\_sym], [R\_val, Ac\_val, Pc\_val]));

result\_Pc = double(subs(DL\_DPc\_sym, [R\_sym, Ac\_sym, Pc\_sym], [R\_val, Ac\_val, Pc\_val]));

% Calculating allowable overall error N and percentage error

N = result\_R \* r\_err + result\_Ac \* ac\_err + abs(result\_Pc) \* pc\_err;

resultsPercentageError = (N / L) \* 100;

end

%% Local function to calculate new error limits (15%)

function resultsNewErrorLimit = calculateNewErrorLimit(R\_val, Ac\_val, Pc\_val, Err\_lim, n)

% Recalculating L for new error limit calculation

L = (R\_val \* Ac\_val) / Pc\_val;

% Calculating new error limits

R\_0\_15 = (Err\_lim \* L) / (result\_R \* n);

Ac\_0\_15 = (Err\_lim \* L) / (result\_Ac \* n);

Pc\_0\_15 = (Err\_lim \* L) / (result\_Pc \* n);

resultsNewErrorLimit = [R\_0\_15, Ac\_0\_15, Pc\_0\_15];

end

FUNCTION CALL FILE

% Values

R\_val = 90;

Ac\_val = 7.85 \* 10^-7;

Pc\_val = 49 \* 10^-8;

% Error margins

r\_err = 9;

ac\_err = 7.85 \* 10^(-8);

pc\_err = 4.9 \* 10^(-8);

% 15% error limit

Err\_lim = 0.15;

n = 3;

% Calling the function

[percentage\_error, new\_error\_limit] = results(R\_val, Ac\_val, Pc\_val, r\_err, ac\_err, pc\_err, Err\_lim, n);

% Displaying the percentage error

disp(['Percentage error: ', num2str(percentage\_error), '%']);

% Labels for new error limits

new\_error\_limit\_labels = {'R', 'Ac', 'Pc'};

% Displaying the new error limits with labels and formatted values

disp('New error limits 15%:');

for i = 1:length(new\_error\_limit)

fprintf('%s: %.10f\n', new\_error\_limit\_labels{i}, new\_error\_limit(i));

end

OUTPUT

Percentage error: 30%

New error limits 15%:

R: 4.5000000000

Ac: 0.0000000392

Pc: -0.0000000245