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% C. Petersen, H. Werkle, Dynamik der Baukonstruktionen
% 2. Auflage, Springer Vieweg, Wiesbaden, 2018
%
% ML_17_1_Hammerfundament: Hammerfundament
%
% Version 1.0, April 2018
% Softwareentwicklung:
% Andrei Firus, M.Eng (andrei.firus@gmail.com)

% Aufbau Eingabedatei: Eingabedatei nicht notwendig

% Ausgabedateien:
% Outputdatei_1: Eingaben- und Ergebnisübersicht

%----- EINGABEBLOCK -----
% Eingaben im Quellcode

va=0.491; % Einsetzgeschwindigkeit des Ambosses [m/s]
m1=7645; % Masse des Ambosses [kg]
m2=54100; % Masse des Fundaments [kg]
k1=3.60*10^9; % Federkonstante Amboss [N/m]
k2=0.77*10^9; % Federkonstante Boden [N/m]
%-----

%----- BERECHNUNGSBLOCK -----
% Ermittlung der Eigenkreisfrequenzen
my=m1/m2; % Hilfswert
oa2=k1/m1; % Hilfswert
of2=k2/(m1+m2); % Hilfswert
zz1=(1+my)*(oa2+of2)/2; % Hilfswert
zz2=(1+my)*oa2*of2; % Hilfswert
zz3=sqrt(zz1^2-zz2); % Hilfswert

omega1=sqrt(zz1-zz3); % 1. Eigenkreisfrequenz
f1=omega1/(2*pi); % 1. Eigenfrequenz
T1=1/f1; % 1. Eigenschwingzeit
omega2=sqrt(zz1+zz3); % 2. Eigenkreisfrequenz
f2=omega2/(2*pi); % 2. Eigenfrequenz
T2=1/f2; % 2. Eigenschwingzeit

% Berechnungszeitschritt
dt=T2/20;

% Zeitvektor für die Berechnung
t_b=0:dt:T1;

% Definition der Ergebnisvektoren
z1=zeros(length(t_b),1);
z2=zeros(length(t_b),1);

% Berechnung der Schwingungsreaktion
for i=1:length(t_b)
    z1(i)=(va/(omega2^2-omega1^2))*( (omega2^2-oa2)*...
        ((sin(omega1*t_b(i)))/omega1)+(oa2-omega1^2)*...
        ((sin(omega2*t_b(i)))/omega2));
    z2(i)=(va/(omega2^2-omega1^2))*((oa2-omega1^2)*(omega2^2-oa2)/...

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        oa2)*(((sin(omega1*t_b(i)))/omega1)-((sin(omega2*t_b(i)))/omega2));
end
%-----

%----- DARSTELLUNGSBLOCK -----
% Grafische Darstellung der Ergebnisse
name_fig1 = 'Schwingungsantworten';
fig1=figure('Name',name_fig1,'NumberTitle','off');
set(fig1,'Position',[200 300 800 500]);

subplot(2,1,1)
plot(t_b,z1,'MarkerSize',3);
title1 = [num2str(1),'. Freiheitsgrad - Amboss'];
title(title1);
xlabel('Zeit [s]');
ylabel('Verschiebung [m]');
grid on; zoom on;

subplot(2,1,2)
plot(t_b,z2,'MarkerSize',3);
title2 = [num2str(2),'. Freiheitsgrad - Fundament'];
title(title2);
xlabel('Zeit [s]');
ylabel('Verschiebung [m]');
grid on; zoom on;
%-----

%----- AUSGABEBLOCK -----
% Ausgabe der Ergebnisse in eine Datei
fid = fopen('Outputdatei_1_Allgemein.txt', 'w');
fprintf(fid,...
        '%s\n','C. Petersen, H. Werkle, Dynamik der Baukonstruktionen');
fprintf(fid,...
        '%s\n','2. Auflage, Springer Vieweg, Wiesbaden, 2018');
fprintf(fid,...
        '%s\n','Softwareentwicklung: Andrei Firus (andrei.firus@gmail.com)');
fprintf(fid,'%s\n','Programm ML_17_1: Eingaben- und Ergebnisseübersicht');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,...
        '%s\n','-----');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,...
        '%s\n','EINGABEDATEN:');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,'%s\n','Einsetzgeschwindigkeit des Ambosses [m/s]:');
fprintf(fid,'%d\n',va);
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,'%s\n','Masse des Ambosses [kg]:');
fprintf(fid,'%d\n',m1);
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,'%s\n','Masse des Fundaments [kg]:');
fprintf(fid,'%d\n',m2);

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[illegible]