```
function [A,B,C,D] = NLmodss(paravec)
% This function generates the linear model for running the nonlinear plant

Vr = paravec(1);
Tf = paravec(2);
lambda = paravec(3);
Cao = paravec(4);
ko = paravec(5);
E = paravec(6);
R = paravec(7);
rho = paravec(8);
Cp = paravec(9);
U = paravec(10);
Aj = paravec(11);
Vj = paravec(12);
Tcin = paravec(13);
rhoj = paravec(14);
Cj = paravec(15);
Tjo = paravec(16);
Trs = paravec(17);
Tjs = paravec(18);
Cas = paravec(19);
F = paravec(20);
Fj = paravec(21);
ks = ko*exp((-E)/(R*Trs));

% linearized plant equation equations
% A matrix of the states (Conc of A, Tr and Tj)
A(1,1) = (-F/Vr)-Vr*ks;
A(1,2) = ((-E)*Vr*Cas*ks)/(R*(Trs^2));
A(1,3) = 0;
A(2,1) = (-lambda*ks)/(rho*Cp);
A(2,2) =  (-F/Vr) - ((lambda*Cas*ks*E)/(rho*Cp*R*(Trs^2))) - ((U*Aj)/(Vr*rho*Cp));
A(2,3) = (U*Aj)/(Vr*rho*Cp);
A(3,1) = 0;
A(3,2) = (U*Aj)/(Vj*rhoj*Cj);
A(3,3) = -Fj/Vj - (U*Aj)/(Vj*rhoj*Cj);

% B matrix
% First column is for the disturbance: feed flowrate (m^3/s)
% Second colum is the manipulated input: cooling water flowrate (m^3/s)
B(1,1) = (Cao-Cas)/Vr;
B(1,2) = 0;
B(2,1) = (Tf-Trs)/Vr;
B(2,2) = 0;
B(3,1) = 0;
B(3,2) = (Tjo-Tjs)/Vj;

C = [0,1,0];
D = [0];
end
```