```
function [state, y] = pllinit(f, D, k, w0, T)
%% Creates and initializes a new phase locked loop.
% Inputs:
%         f - Nominal ref. frequency
%         D - Damping factor
%         k - Loop gain
%         w0 - Loop corner frequency
%         T - Sample period
%bfs = buffer size
% Outputs:
%          state    -   Current/Initial state
%% Add/Save parameters
    state.f= f;
    state.D= D;
    state.k= k;
    state.w0= w0;
    state.T=T;
%% compute coefficients
    tau1 = k/(w0 * w0) ;
    tau2 = 2*D/w0 - 1/k ;
    state.a1=-(T-2*tau1)/(T+2*tau1);
    state.b0=(T+2*tau2)/(T+2*tau1);
    state.b1=(T-2*tau2)/(T+2*tau1);
%% lookup table
    state.sin_table = sin(2*pi*linspace(0,1023/1024, 1024));
%% Create Initialized state variables
    state.ym1 = 0;
    state.xm1 = 0;
    state.zm1 = 0;
    state.vm1 = 0;
    state.acc = 0;
    % for amplitude modulation
    state.amp_est = 1;
end
```