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% Impulse Response Example(chap2_DT_impulse_delay.m)
% Find the impulse response for a Chebyshev Type 1
% HP filter (IIR) to a delayed input
% Difference equation-
%  $y[n]-1.516y[n-1]+0.703y[n-2]=0.57x[n]-1.14x[n-1]+0.57x[n-2]$ 
% Initial conditions-
%  $y[-1]=y[-2]=x[-1]=x[-2]=0$ 
% Input-
%  $x[n]=\delta[n-5]$ 
%
a=[-1.516, 0.703]; % coeff. for  $y[n-i]$  terms
b=[0.57,-1.14,0.57]; % coeff. for  $x[n]$  terms
n=0:24; % range of indices
% Set up input signal
x=zeros(1,length(n)); x(6)=1; % Note the delay
% stem(n,x) % check input
% Set up initial conditions for  $n<0$ 
x0=[0,0]; y0=[0,0];
% Calculate impulse response recursively
y=recur(a,b,n,x,x0,y0);
stem(n,y,'r.')
grid
axis([-1 25 -0.4 0.7]);
ylabel('h[n-5]','fontsize',16,'fontname','times')
xlabel('n','fontsize',16,'fontname','times')
title('Delayed Chebyshev Type 1 HP filter Impulse Response',...
      'fontsize',16,'fontname','times')
set(findobj('type','line'),'linewidth',1.5)
set(findobj('type','line'),'markersize',18)
set(findobj('type','axes'),'linewidth',2)
```

## Delayed Chebyshev Type 1 HP filter Impulse Response

