Syntax

```
[n,Wn] = ellipord(Wp,Ws,Rp,Rs)
[n,Wn] = ellipord(Wp,Ws,Rp,Rs,'s')
```

Description

[n,Wn] = ellipord(Wp,Ws,Rp,Rs) returns the lowest order, n, of the digital elliptic filter with no more than Rp dB of passband ripple and at least Rs dB of attenuation in the stopband. Wp and Ws, are respectively, the passband and stopband edge frequencies of the filter, normalized from 0 to 1, where 1 corresponds to π rad/sample. The scalar (or vector) of corresponding cutoff frequencies, Wn, is also returned. To design an elliptic filter, use the output arguments n and Wn as inputs to ellip.

[n,Wn] = ellipord(Wp,Ws,Rp,Rs,'s') finds the minimum order n and cutoff frequencies Wn for an analog elliptic filter. Specify the frequencies Wp and Ws in radians per second. The passband or the stopband can be infinite.

Syntax

```
[b,a] = ellip(n,Rp,Rs,Wp)
[b,a] = ellip(n,Rp,Rs,Wp,ftype)
[z,p,k] = ellip(_)
[A,B,C,D] = ellip(_)
[_] = ellip(_,'s')
```

Description

[b,a] = ellip(n,Rp,Rs,Wp) returns the transfer function coefficients of an nth-order lowpass digital elliptic filter with normalized passband edge frequency Wp. The resulting filter has Rp decibels of peak-to-peak passband ripple and Rs decibels of stopband attenuation down from the peak passband value.

[b,a] = ellip(n,Rp,Rs,Wp,ftype) designs a lowpass, highpass, bandpass, or bandstop elliptic filter, depending on the value of ftype and the number of elements of Wp. The resulting bandpass and bandstop designs are of order 2n.

[z,p,k] = ellip(_) designs a lowpass, highpass, bandpass, or bandstop digital elliptic filter and returns its zeros, poles, and gain. This syntax can include any of the input arguments in previous syntaxes.

[A,B,C,D] = ellip(_) designs a lowpass, highpass, bandpass, or bandstop digital elliptic filter and returns the matrices that specify its state-space representation.

[_] = ellip(_,'s') designs a lowpass, highpass, bandpass, or bandstop analog elliptic filter with passband edge angular frequency Wp, Rp decibels of passband ripple, and Rs decibels of stopband attenuation

Syntax

```
[bt,at] = lp2bp(b,a,Wo,Bw)
[At,Bt,Ct,Dt] = lp2bp(A,B,C,D,Wo,Bw)
```

Description

[bt,at] = lp2bp(b,a,Wo,Bw) transforms an analog lowpass filter prototype given by polynomial coefficients (specified by row vectors b and a) into a bandpass filter with center frequency Wo and bandwidth Bw. The input system must be an analog filter prototype.

[At,Bt,Ct,Dt] = lp2bp(A,B,C,D,Wo,Bw) converts the continuous-time state-space lowpass filter prototype (specified by matrices A, B, C, and D) to a bandpass filter with center frequency Wo and bandwidth Bw. The input system must be an analog filter prototype.