a)

The Block Diagram can be simplified using the feedback equation

$$T = \frac{G}{1 + GH}$$

Using G=1/(s+1)(s+2) and H=(1/s), we find T=s/(s^3+3s^2+2s+1).

Combining with the K block in cascade, we write

Gnew(s) = Ks/(s^3+3s^2+2s+1)

Finally, we can use feedback again to simplify to a single block

Tfinal(s) = Ks/(s^3+3s^2+(K+2)s+1)

b)
We can use a Routh table to check for stability

```
s^3     1            K+2
s^2     3            1
s^1     (5+3K)/3     0
s^0     1
```

To keep the first row positive, we need (5+3K)/3 > 0 or K > -5/3.