11.14

From the block diagram, the characteristic equation is obtained as

$$1 + K_c \left[\frac{(0.5)\left(\frac{4}{s+3}\right)}{1 + (0.5)\left(\frac{4}{s+3}\right)} \right] \left[\frac{2}{s-1} \right] \left[\frac{1}{s+10} \right] = 0$$

that is,

$$1 + K_c \left[\frac{2}{s+5} \right] \left[\frac{2}{s-1} \right] \left[\frac{1}{s+10} \right] = 0$$

Simplifying,

$$s^3 + 14s^2 + 35s + (4K_c - 50) = 0$$

The Routh Array is

1	35
14	$4K_c$-50
$\frac{490 - (4K_c - 50)}{14}$	
$4K_c - 50$	

For the system to be stable,

$$\frac{490 - (4K_c - 50)}{14} > 0 \qquad \text{or} \qquad K_c < 135$$

and $4K_c - 50 > 0$ or $K_c > 12.5$

Therefore $12.5 < K_c < 135$