14.53 The transfer function of the network is given by the expression

$$\mathbf{G}(s) = \frac{100s}{s^2 + 13s + 40}$$

Determine the damping ratio, the undamped natural frequency, and the type of response that will be exhibited by the network.

SOLUTION:

Char. eq. is $s^2 + 13s + 40 = s^2 + 2\zeta\omega_0 s + \omega_0^2 = 0$

$\boxed{\omega_0 = \sqrt{40} \text{ r/s}}$

$2\zeta\omega_0 = 13 \Rightarrow \zeta = \frac{13}{2\sqrt{40}} \Rightarrow \boxed{\zeta = 1.03}$

$\boxed{\zeta > 1 \text{ (barely), so system is overdamped}}$