

Concept Question 3-15: For stable systems, the transient response includes what other responses?

The transient response includes the natural response. It may also include part of the forced response, if the input is a decaying exponential function. See Eq. (3.144) for an example of this:

$$\begin{aligned} v(t) &= [2e^{-3t} + 12e^{-3t}] u(t) + [6 - 18e^{-2t}] u(t) \\ &= \underbrace{14e^{-3t} u(t)}_{\text{Natural response}} + \underbrace{[6 - 18e^{-2t}] u(t)}_{\text{Forced response}}. \end{aligned} \quad (3.144)$$