Part 7

Wednesday, May 8, 2019 9:06 PM

PART 7

$u^*(0) = u_{max}$

$\forall\, t \in [0, t_{sw}] \quad \phi(t) < 0 \Rightarrow u^*(t) = u_{max}$

$\forall\, t \in (t_{sw}, t_f] \quad \phi(t) > 0 \Rightarrow u^*(t) = 0$

$\therefore \forall\, t \in (t_{sw}, t_f] \quad \dot{m}(t) = -b u^*(t) = 0$

$\Rightarrow m(t_{sw}) = m(t_f) = m_f$

$\forall\, t \in [0, t_{sw}] \quad \dot{m}(t) = -b u^*(t) = -b u_{max} = \text{const}$

$\Rightarrow m(t_{sw}) = m(0) + (-b u_{max})(t_{sw})$

$\Rightarrow t_{sw} = \dfrac{m(t_{sw}) - m_0}{-b u_{max}}$

$\Rightarrow \boxed{t_{sw} = \dfrac{m_0 - m_f}{b u_{max}}}$