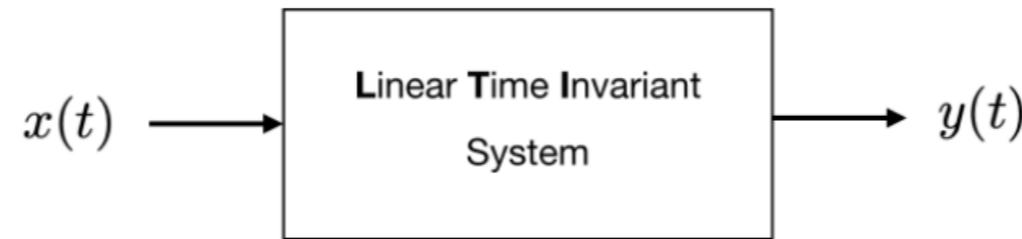


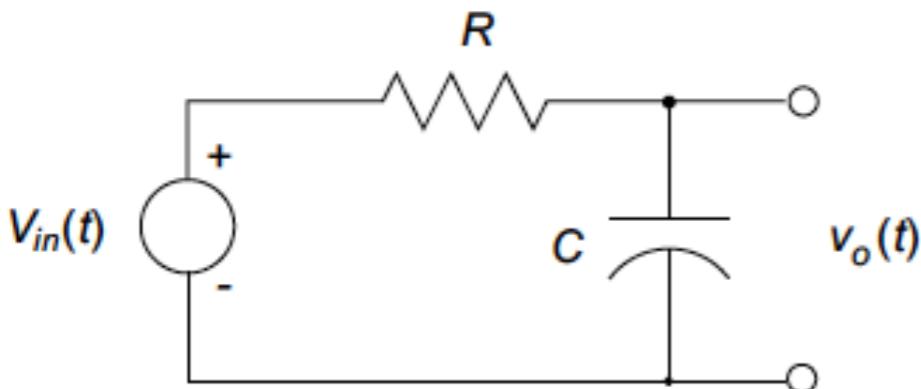
# Examples of LTI Systems



$$\left( a_n \frac{d^n}{dt^n} + a_{n-1} \frac{d^{n-1}}{dt^{n-1}} + \dots + a_1 \frac{d}{dt} + a_0 \right) y(t) = \left( b_m \frac{d^m}{dt^m} + b_{m-1} \frac{d^{m-1}}{dt^{m-1}} + \dots + b_1 \frac{d}{dt} + b_0 \right) x(t)$$

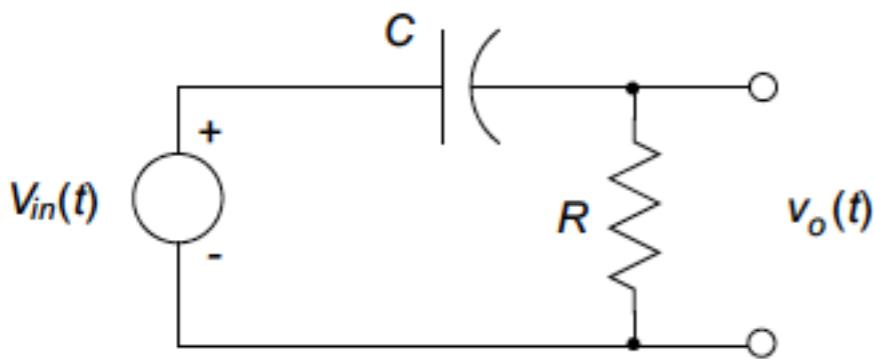
## Example 1



$$RC \frac{dv_o}{dt} + v_o = V_{in}(t)$$

$$\begin{aligned} a_1 &= RC \\ a_0 &= 1 \\ b_0 &= 1 \end{aligned}$$

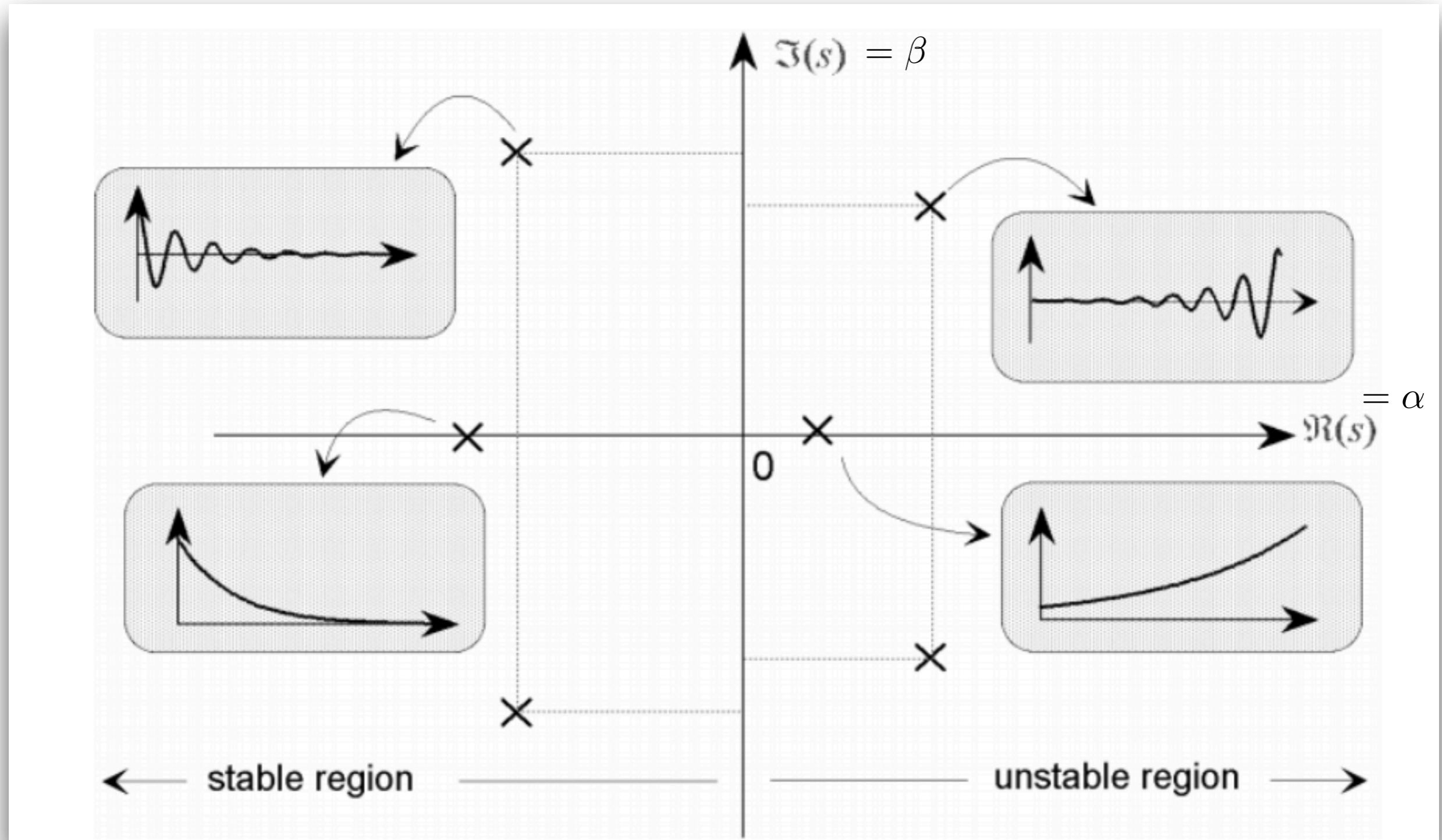
## Example 2



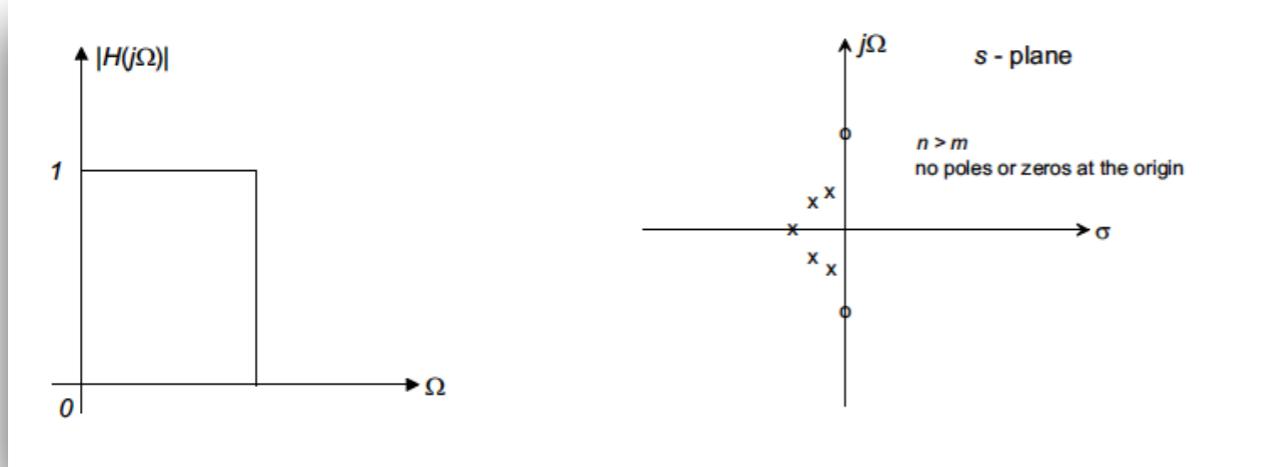
$$RC \frac{dv_o}{dt} + v_o = RC \frac{dV_{in}}{dt}$$

$$\begin{aligned} a_1 &= RC \\ a_0 &= 1 \\ b_1 &= RC \end{aligned}$$

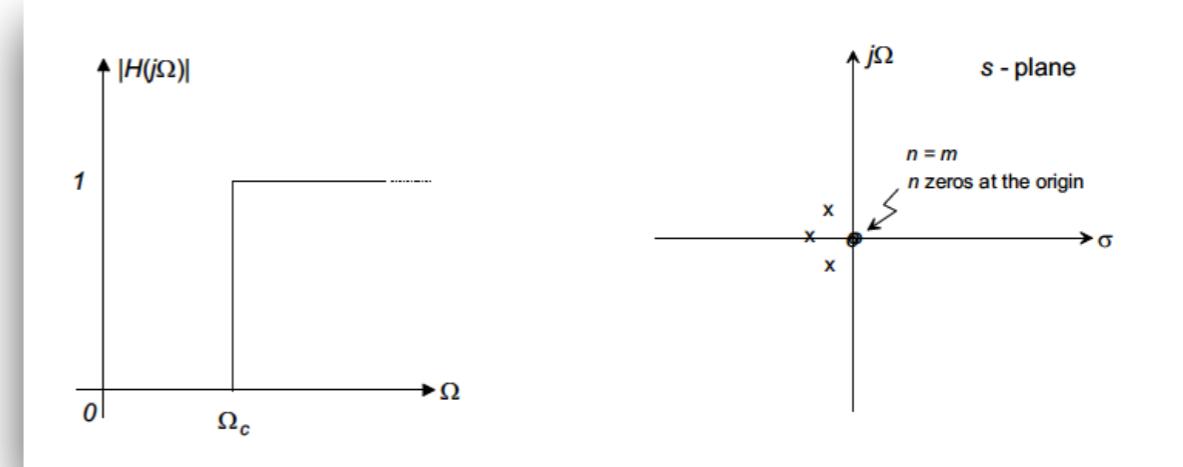
$$y_h(t) = \sum_k c_k e^{p_k \cdot t} = \sum_k c_k e^{\alpha_k t} e^{i\beta_k t} \quad p_k = \alpha_k + i\beta_k$$



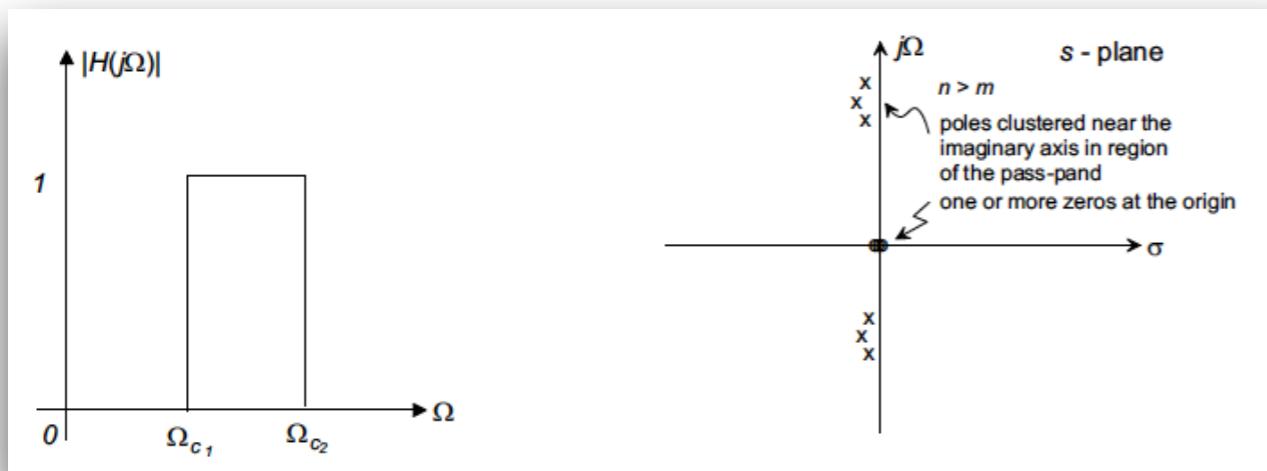
## Low-Pass



## High-Pass



## Band-Pass



## Band-Stop

