

HW6 题号 106061151 刘俊峰

1.

$$y'(t) = \int_0^t x(\tau) - \beta y(\tau) d\tau$$

$$y'(t) = x(t) - \beta y(t)$$

$$y'(t) + \beta y(t) = x(t)$$

$$h'(t) + \beta h(t) = \delta(t)$$

$$h(t) = w(t) u(t)$$

$$w' u + w u' + \beta w u = \delta(t)$$

$$(w' + \beta w) u + w(0) \delta(t) = \delta(t)$$

$$\Rightarrow w' + \beta w = 0$$

$$w(0) = 1$$

$$w = C \cdot e^{-\beta t}$$

$$w(0) = C = 1$$

$$w(t) = e^{-\beta t}$$

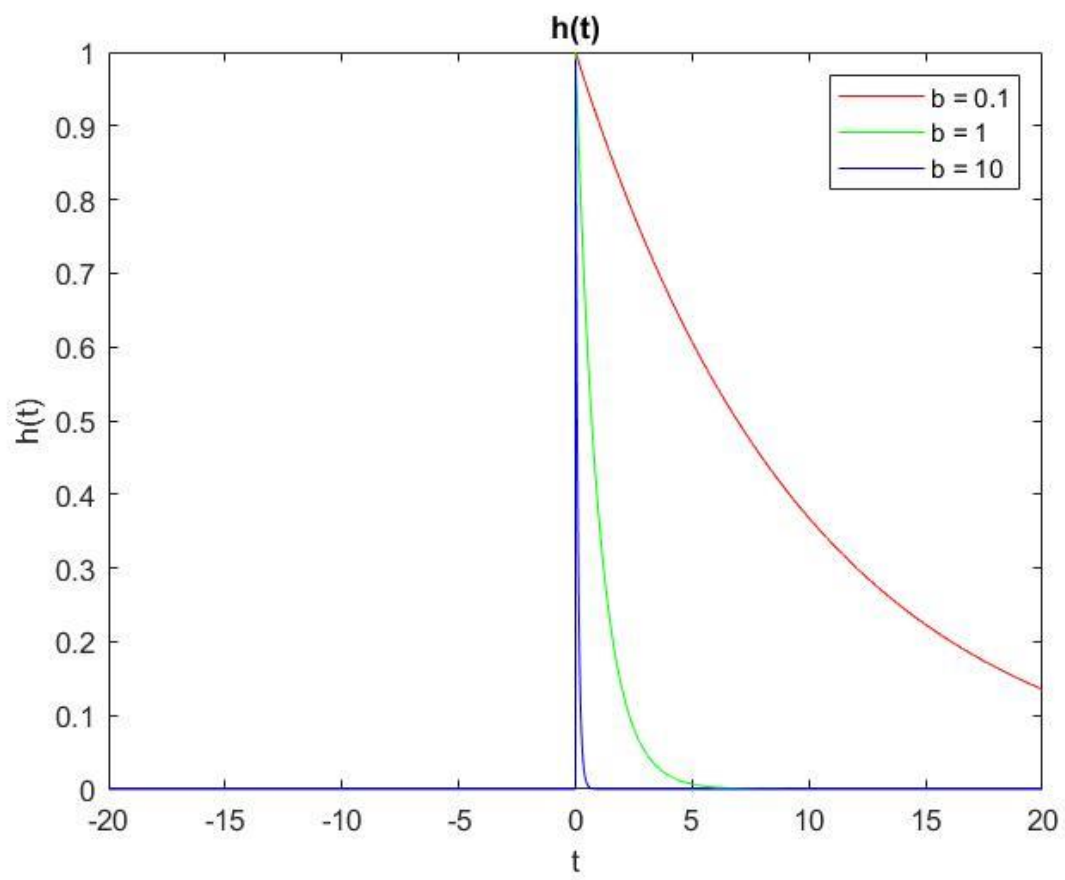
$$h(t) = e^{-\beta t} u(t) \quad H(f) = \frac{1}{\beta + j2\pi f}$$

$$\begin{cases} |H(f)| = \frac{1}{\sqrt{\beta^2 + 4\pi^2 f^2}} \\ \angle H(f) = -\tan^{-1} \frac{2\pi f}{\beta} \end{cases}$$

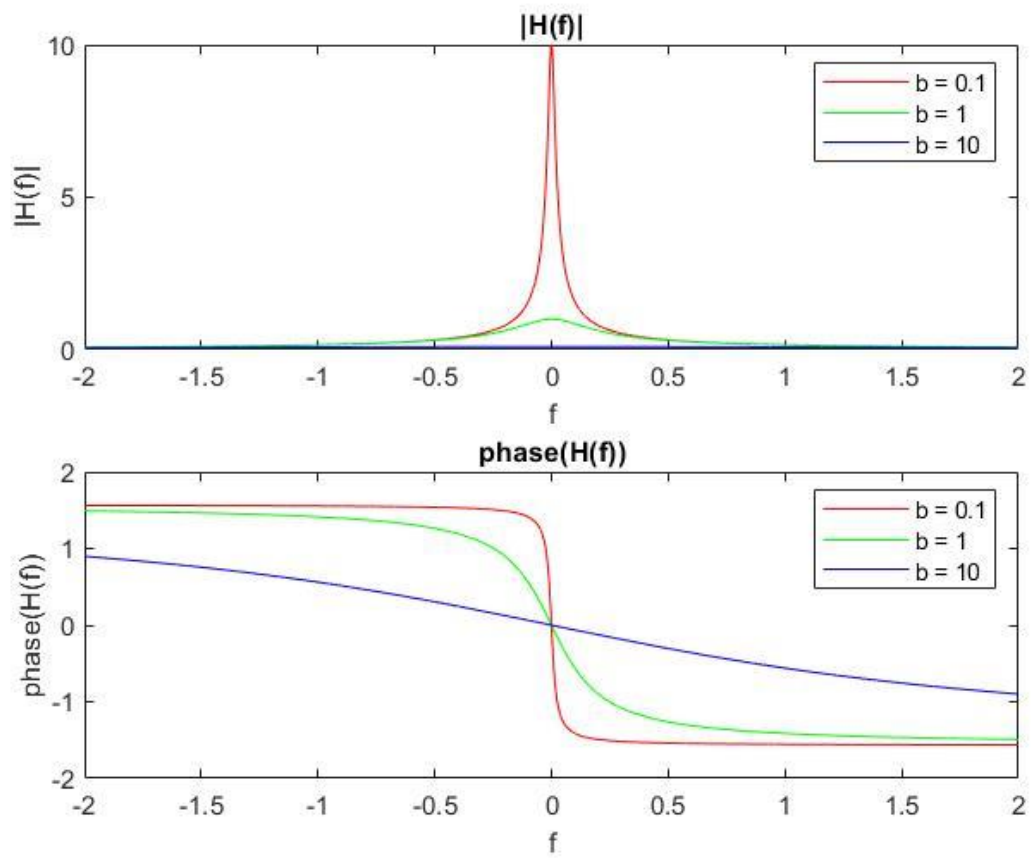
$$y(t) = H(f) x(t)$$

$$= \frac{1}{\beta + j2\pi f} x(t)$$

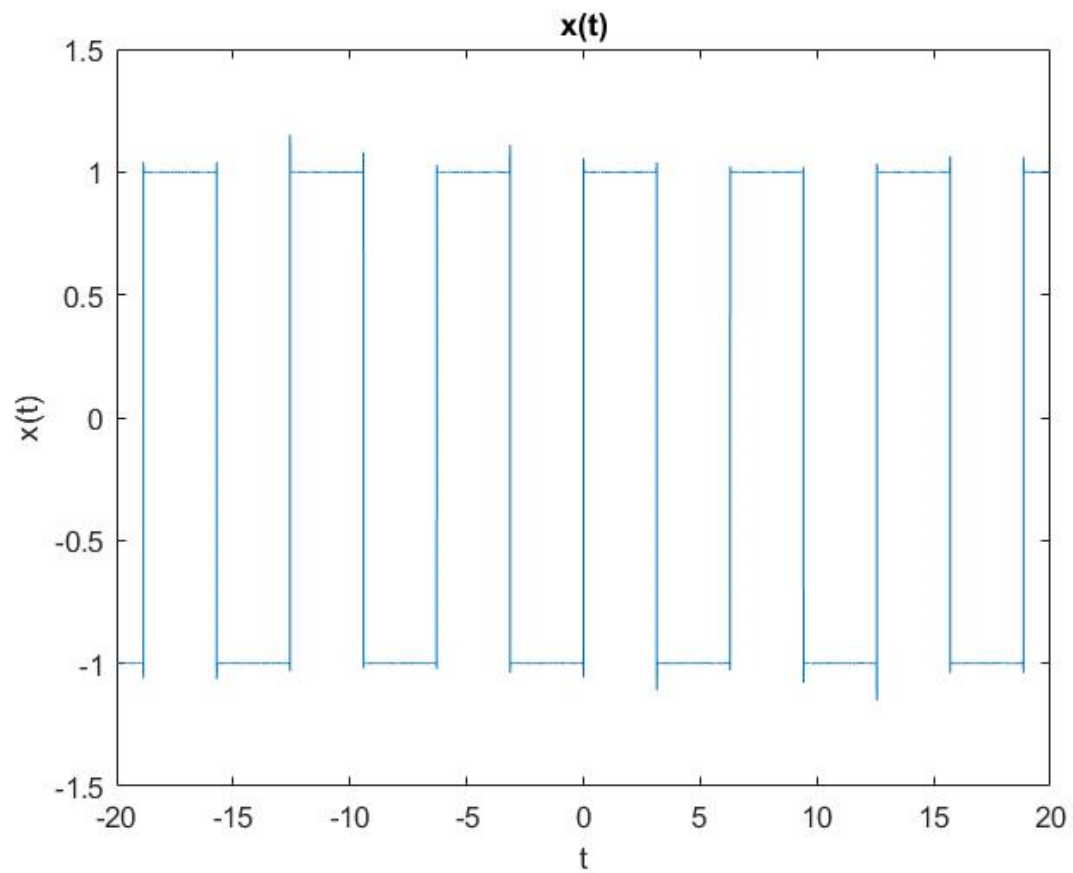
2.  $h(t)$



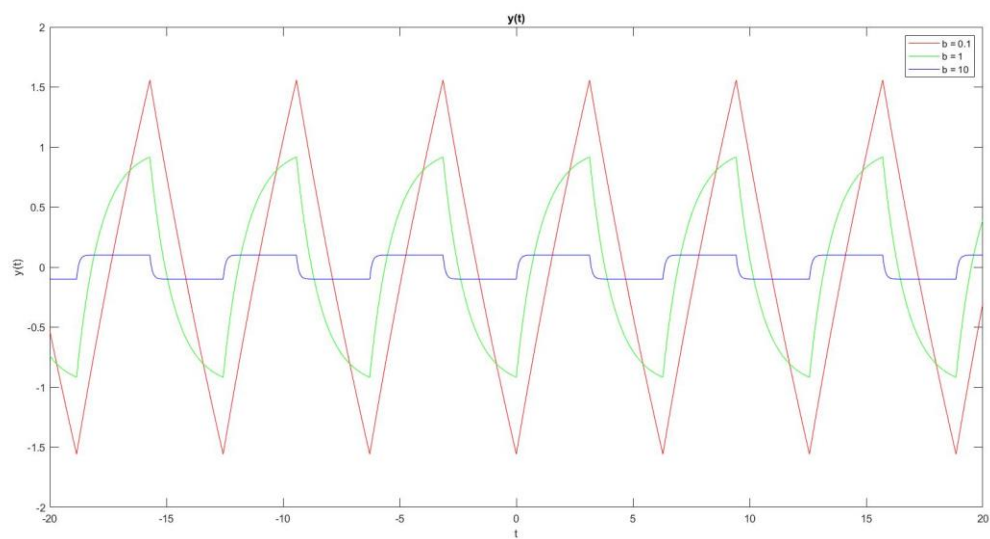
### 3. $H(f)$



#### 4. $x(t)$



#### $y(t)$



5. 由 2.可知當  $b = 10$  時  $h(t)$ 最像 delta function。而看 4.的  $y(t)$ 圖也可發現，當  $b = 10$  時最接近方波，但相對來說震幅較小。由以上可得， $b$  越大，失真越小， $b$  越小，失真越大。