19-20-2B 信号与系统期末 B 卷参考解答

一、计算题（10 分）

Solutions:

(a) $h(t)=u(t)-u(t-1)-\frac{1}{2}u(t-2)+\frac{1}{2}u(t-3)$ (4 points)

(b) $y(t)=s(t)-s(t-2)$ (2 points)

$$y(t)=tu(t)-(t-1)u(t-1)-\frac{3}{2}(t-2)u(t-2)+(t-3)u(t-3)+\frac{1}{2}(t-4)u(t-4)-\frac{1}{2}(t-6)u(t-6)$$ (4 points)

二、计算题（0 分）

Solutions:

$h[n]=\delta[n]+2\delta[n-1]$ (5 points)

$y[n]=u[n]+2u[n-1]$ (5 points)

三、计算题（10 分）

Solutions:

(a) Linear (2 points)

(b) not time-invariant (2 points)

(c) not memoryless (2 points)

(d) not causal (2 points)

(e) not stable (2 points)

四、计算题（12 分）

Solutions:

(a) $H(j\omega)=\left(1-e^{-2j\omega}\right)\left[\pi\delta(\omega)+\frac{1}{j\omega}\right]$ (4 points)

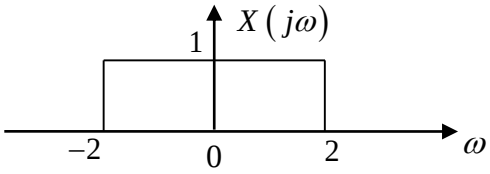
$$H(j\omega)=\frac{1-e^{-2j\omega}}{j\omega}$$ (4 points)

(b) $h(t)=u(t)-u(t-2)$ (4 points)

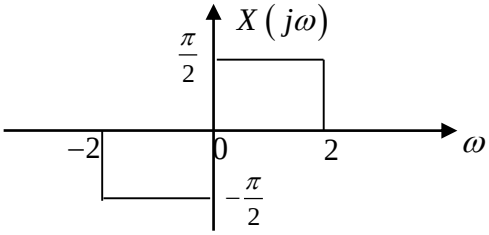
五、计算题（12 分）

Solutions:

(a)



(4 points)

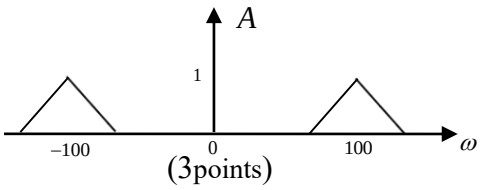


(4points)

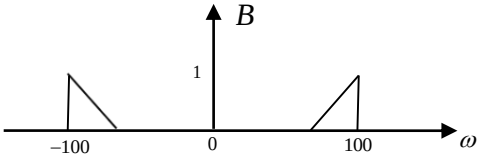
$$y(t)=\frac{1}{2}x(t) \quad \text{(2 points)}$$

六、计算题（14 分）

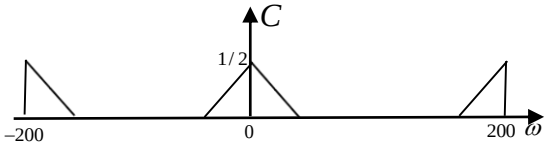
(a)



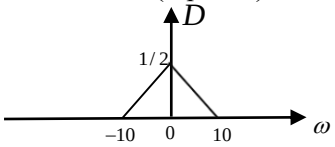
(3points)



(3points)



(3 points)



(3points)

$$E_y=\int_{-\infty}^{+\infty}\left|y(t)\right|^2 dt=\frac{1}{2\pi}\int_{-\infty}^{+\infty}\left|Y(j\omega)\right|^2 d\omega=\frac{8}{3\pi} \quad \text{(4 points)}$$

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七、计算题（16 分）

Solution:

(a) $\dfrac{dy(t)}{dt}+y(t)=x(t)$ (6 points)

(b) $H(s)=\dfrac{1}{s+1}$ $\mathrm{Re}\{s\}>-1$ (6 points)

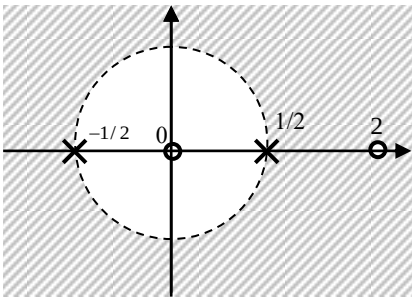
(c) The system is a lowpass filter. (4 points)

八、计算题（16 分）

Solution:

(a) $H(z)=\dfrac{1}{1-\dfrac{1}{2}z^{-2}}$ $|z|>\dfrac{\sqrt{2}}{2}$ (6 points)

(b)



(6 points)

(c) $y[n]=4+\dfrac{-je^{j\frac{\pi}{6}n}}{1-\dfrac{1}{2}e^{-j\frac{\pi}{3}}}+\dfrac{je^{-j\frac{\pi}{6}n}}{1-\dfrac{1}{2}e^{j\frac{\pi}{3}}}$ (4 points)