Results

Problem 1

A2e, B3a, C5c, D1d, E4b

Problem 2

2.1 $B_1 = \max(a,b)$, $B_2 = \min(a,b)$

2.2 $X(f) = \mathrm{si}^2(\pi f)$, $Y(f) = \mathrm{j}\cdot 4 \cdot \mathrm{si}^2(\pi f) \cdot \sin(\pi f)$

Problem 3

3.1 $H(s) = \dfrac{3s+2}{s^2+3s+2}$

3.2 $y(t) = 2\cdot\left(1+\mathrm{e}^{-t}-2\,\mathrm{e}^{-2t}\right)\cdot u(t)$, $y(0)=0$, $y(\infty)=2$

3.3 $\hat{y} = \left|H(s=\mathrm{j}\omega)\right| \cdot \hat{x}$

Problem 4

4.1 $X(f) = \dfrac{\mathrm{j}}{4}\cdot\left\{\delta(f+5\ \mathrm{Hz})+\delta(f+1\ \mathrm{Hz})-\delta(f-1\ \mathrm{Hz})-\delta(f-5\ \mathrm{Hz})\right\}$

4.2 $X_\mathrm{s}(f) = 6\ \mathrm{Hz}\cdot\sum\limits_{k=-\infty}^{+\infty} X(f-k\cdot 6\ \mathrm{Hz}) = 0$

Problem 5

5.1 N even: $M \geq N/2$, N odd: $M \geq (N-1)/2$

5.2 $X[k] = X^*\left[\langle -k\rangle_N\right]$ **5.3** $X[4]=2$, $X[5]=1-\mathrm{j}$

5.4 $x[n] = \dfrac{1}{6}\cdot\left\{(-1)^n - 2\cdot\sin\left(\dfrac{\pi n}{3}\right)\right\}$

Problem 6

6.1 IIR

6.2 $y[n]+2\cdot y[n-1]+2\cdot y[n-2] = x[n]-x[n-1]-5\cdot x[n-2]$

6.3 $H(z) = \dfrac{1-z^{-1}-5\cdot z^{-2}}{1+2\cdot z^{-1}+2\cdot z^{-2}}$

6.4 $p_{1,2} = -1\pm\mathrm{j}$, not stable **6.5** $\left|H(0)\right| = 1 = 0$ dB

6.6 $z_1 = 2.79$, $z_2 = -1.79$; curve similar to problem 1, d **6.7** ...