

1. a) $y \neq y$

b) NNN

5. $\{-1, -4, -8, -8, -3\}$

6. a) $y_s(n) = \left(\frac{1}{2}\right)^{n+1} u(n)$

b) $y_x(n) = 3 \left(\left(\frac{1}{2}\right)^{n+1} u(n) + \left(\frac{1}{3}\right)^n u(n) \right)$

c) $\tilde{y}(n) = \left[\frac{7}{2} \left(\frac{1}{2}\right)^n + 6 \left(\frac{1}{3}\right)^n \right] u(n)$

7. ROC: $|z| > 1$

8. a) $X(z) = \frac{\left(\frac{1}{3}\right)^5 z^{-4} - \left(\frac{1}{3}\right)^{100} z^{-11}}{\left(z - \frac{1}{3}\right)}$; ROC: $z \neq 0$

b) $X(z) = z^{-1} - z^{-2} + 3z^{-5}$; ROC: $z \neq 0$

c) $X(z) = e^{-64} z^{-8} + e^{-81} z^{-9} + e^{-100} z^{-10}$; ROC: $z \neq 0$

9. a) $(2^{n+1} - 1) u(n)$

b) $5^{n-99} u(n-99)$

c) $\delta(n-100) + 5^n u(n)$

10. $y_x(n) = \frac{1}{5} \left(\frac{1}{2}\right)^n u(n) + \left[\left(\frac{2-j}{5}\right) e^{j\frac{n\pi}{2}} + \left(\frac{2+j}{5}\right) e^{-j\frac{n\pi}{2}} \right] u(n)$

11. a) $y_s(n) = \left(\frac{1}{2}\right)^{n+1} u(n)$

b) $H(z) = \frac{z^2 - 1}{z^2 - z + \frac{1}{4}}$

12. $h(n) = 4 \left(\frac{1}{3}\right)^n u(n) - \frac{3}{2} \left(\frac{1}{3}\right)^{n-1} u(n-1)$

ECE 310 Fall 1999 Exam 2 solutions

1. a) Y Y
 b) Y N
 c) N N

2. a) N
 b) N
 c) Y
 d) N
 e) Y

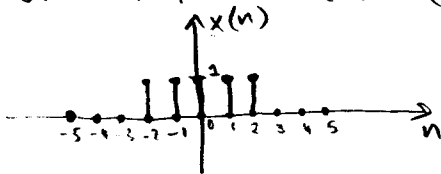
3. a) $|z| > 1.5, |z| < 0.5, 0.5 < |z| < 1.5$

b) $|z| > 1.5: h(n) = [(0.5)^n + (1.5)^n] u(n) \Rightarrow$ causal, not BIBO stable

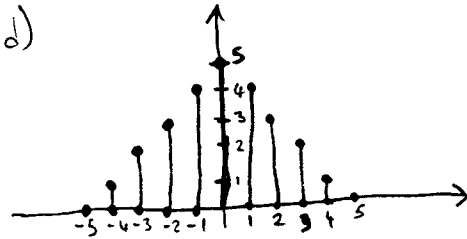
$|z| < 0.5: h(n) = -[(0.5)^n + (1.5)^n] u(-n-1) \Rightarrow$ not causal, not BIBO stable

$0.5 < |z| < 1.5: h(n) = (0.5)^n u(n) - (1.5)^n u(-n-1) \Rightarrow$ not causal, BIBO stable

4. a)

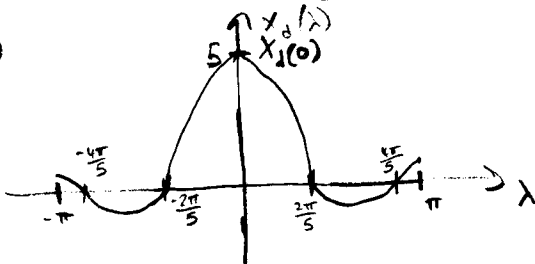


d)

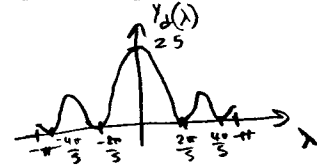


b) $X_d(\lambda) = \frac{\sin(5\lambda/2)}{\sin(\lambda/2)}$

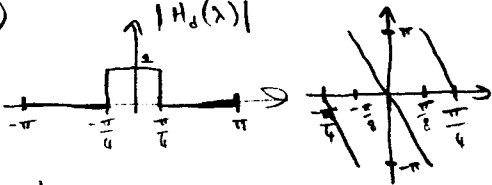
c)



e) $Y_d(\lambda) = 5 + 8\cos(\lambda) + 6\cos(2\lambda) + 4\cos(3\lambda) + 2\cos(4\lambda)$



5. a)



b) low pass

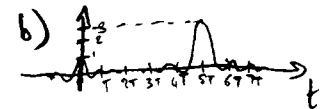
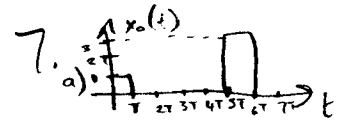
c) $y(n) = \cos\left(\frac{n\pi}{10} - \frac{4\pi}{5}\right) + \frac{1}{2} \cos\left(\frac{n\pi}{5} - \frac{8\pi}{5}\right)$

6. a) $h(n) = -3j [\delta(n+3) - \delta(n-3)] - [\delta(n-1) + \delta(n+1)]$

b) i. $y(n) = -2$

ii. $y(n) = 2(-1)^n$

iii. $y(n) = -6j \sin\left(\frac{n\pi}{2} - \frac{\pi}{2}\right)$



8. a) $T = 25 \text{ MS}$

