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| 学 院：电子信息工程学院 | 实验名称： 实验二 信号、系统及系统响应 | |
| 班 级： | 实验时间：2023.5.6 | 成 绩： |
| 姓 名： | 教师评语： | |
| 学 号： |

一.实验目的

二.实验原理

三.实验内容

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| %1.(1)  A = 200;  alpha = 75 \* pi;  Omega\_0 = 75 \* pi;  t = linspace(0, 0.01, 1000);  x\_a = A \* exp(-alpha \* t) .\* sin(Omega\_0 \* t) .\* (t >= 0);  figure(1);  plot(t, x\_a);  title('时域波形');  xlabel('时间 t');  ylabel('x\_a(t)');  %(2)  f = linspace(-1000, 1000, 1000);  X\_a = A \* (Omega\_0) ./ ((1i \* 2 \* pi \* f + alpha).^2 + Omega\_0^2);  figure(2);  plot(f, abs(X\_a));  title('幅度谱');  xlabel('频率 f');  ylabel('|X\_a(j\Omega)|');  %(3)  fs = [2000, 1000, 400];  T = 0.1;  for i = 1:length(fs)  t = 0:1/fs(i):T;  x\_n = A \* exp(-alpha \* t) .\* sin(Omega\_0 \* t);  X\_n = fft(x\_n);  f\_n = (0:length(X\_n)-1) \* fs(i) / length(X\_n);    figure(3);  subplot(3, 1, i),plot(f\_n, abs(X\_n));  title(['幅度谱 (fs = ' num2str(fs(i)) ' Hz)']);  xlabel('频率 f');  ylabel('|X\_n(j\Omega)|');  X\_n\_normalized = X\_n / max(abs(X\_n));  figure(4);  subplot(3, 1, i),plot(f\_n, abs(X\_n\_normalized));  title(['归一化幅度谱 (fs = ', num2str(fs(i)), ' Hz)']);  xlabel('频率 f');  ylabel('归一化 |X\_a(j\Omega)|');  end |  |
| %2.(1)  n = 1:100;  x1 = cos(0.04 \* pi \* n);  x2 = cos(0.24 \* pi \* n);  x3 = cos(0.32 \* pi \* n);  numerator = 0.0007289 \* conv(conv(conv([1, 1], [1, 1]), conv([1, 1], [1, 1])),conv([1, 1], [1, 1]));  denominator = conv(conv([1, -1.2686, 0.7051], [1, -1.0106, 0.3583]), [1, -0.9044, 0.2155]);  y1 = filter(numerator, denominator, x1);  y2 = filter(numerator, denominator, x2);  y3 = filter(numerator, denominator, x3);  x4 = x1 + x2 + x3;  y4 = filter(numerator, denominator, x4);  figure(1);subplot(2, 2, 1);stem(n, x1,'.');  title('x\_1(n)');  subplot(2, 2, 2);stem(n, y1,'.');  title('y\_1(n)');  subplot(2, 2, 3);stem(n, x2,'.');  title('x\_2(n)');  subplot(2, 2, 4);stem(n, y2,'.');  title('y\_2(n)');  figure(2);subplot(2, 2, 1);stem(n, x3,'.');  title('x\_3(n)');  subplot(2, 2, 2);stem(n, y3,'.');  title('y\_3(n)');  subplot(2, 2, 3);stem(n, x4,'.');  title('x\_4(n)');  subplot(2, 2, 4);stem(n, y4,'.');  title('y\_4(n)');  y = y1 + y2 + y3;  figure(3);stem(n, y, '.');title('y\_4(n)');  [H, w] = freqz(numerator, denominator, 512);  figure(4);  subplot(2, 1, 1);plot(w / pi, abs(H));  title('幅频响应特性');xlabel('\omega/\pi');  ylabel('|H(e^{j\omega})|');  subplot(2, 1, 2);plot(w / pi, angle(H));  title('相频响应特性');xlabel('\omega/\pi');  ylabel('Phase (radians)');  figure(5);  plot(w / pi, 20 \* log10(abs(H)));  title('对数幅频特性');xlabel('\omega/\pi');  ylabel('|H(e^{j\omega})| (dB)');  omega = [0.04 \* pi, 0.24 \* pi, 0.32 \* pi];  H\_omega = freqz(numerator, denominator, omega);  figure(6);plot(w / pi, abs(H));  hold on;  plot(omega / pi, abs(H\_omega), 'ro');  title('幅频响应特性');xlabel('\omega/\pi');  ylabel('|H(e^{j\omega})|');  hold off; |  |

四.实验总结