Matlab 编程第三次作业

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1) 由未量化 (32 位量化)，14 位量化，8 位量化系数求系统函数；

图：

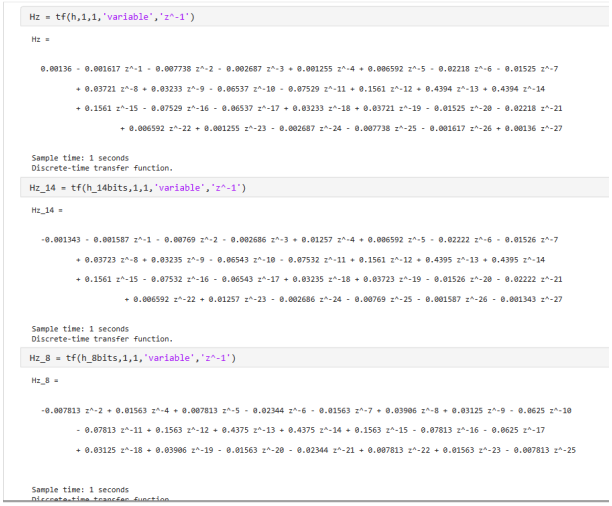

图 1:

```
format long
h1 = [1.359657e-3,-1.616993e-3,-7.738032e-3,-2.686841e-3,1.255246e-3,...
       6.591530e-3,-2.217952e-2,-1.524663e-2,3.720668e-2,3.233332e-2,-6.537057e-2,-7.528754e-2
       1.560970e-1,4.394094e-1];
h2 = flip(h1);
h = [h1,h2];
%14bits
format long
h1 = [-11,-13,-63,-22,103,54,-182,-125,305,265,-536,-617,1279,3600]*2^(-13);
h2 = flip(h1);
h_14bits = [h1,h2];
%8bits
format long
h1 = [0,0,-1,0,2,1,-3,-2,5,4,-8,-10,20,56]*2^(-7);
h2 = flip(h1);
h_8bits = [h1,h2];

% 第一题
syms z
n = 0:27;
Hz = sum(h.*z.^(-n));
Hz_8 = sum(h_8bits.*z.^(-n));
Hz_14 = sum(h_14bits.*z.^(-n));
```

2) 由系统函数，求出零点（分母设为 z-27 ），并画零点图；
图：

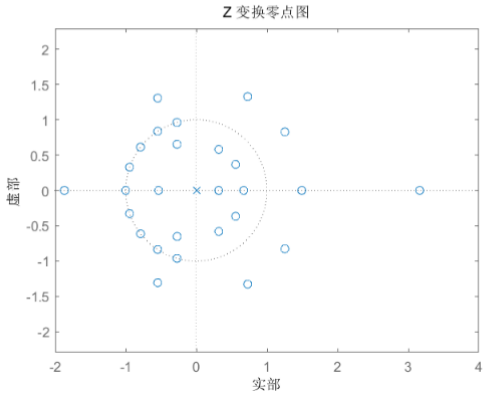

图 2:

```
%第二题
zero_n = roots(h);
zero_14 = roots(h_14bits);
zero_8 = roots(h_8bits);
%plot the map
figure;
zplane(h,1);
title('Z 变换零点图');
```

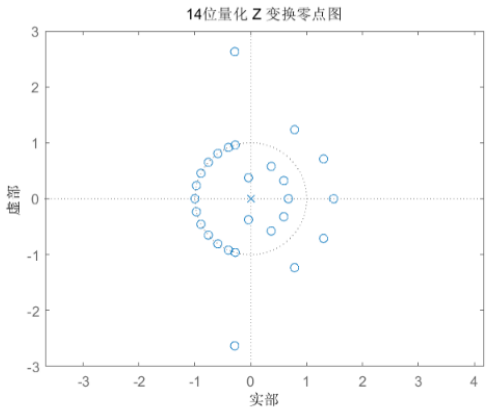

图 3:

```
xlabel('实部');
ylabel('虚部');
```

```
figure;
zplane(h_14bits,1);
title('14位量化 Z 变换零点图');
```

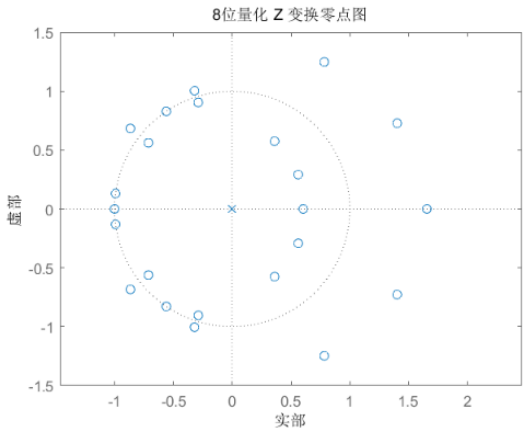

图 4:

```
xlabel('实部');
ylabel('虚部');

figure;
zplane(zero_8,1);
title('8位量化 Z 变换零点图');
xlabel('实部');
ylabel('虚部');
```

3) 由零点，求出系统函数因式形式；图：

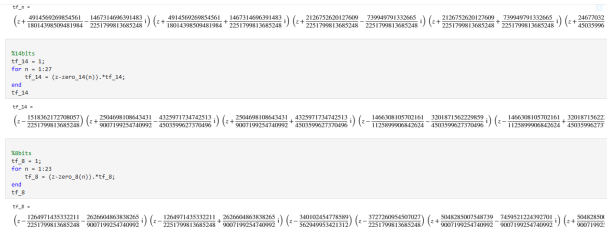

图 5:

```
%第三题
%no quantilize
tf_n = 1;
for n = 1:27
    tf_n = (z-zero_n(n)).*tf_n;
end
tf_n


%14bits
tf_14 = 1;
for n = 1:27
    tf_14 = (z-zero_14(n)).*tf_14;
end
tf_14


%8bits
tf_8 = 1;
for n = 1:25
    tf_8 = (z-zero_8(n)).*tf_8;
end
tf_8
```

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4) 由系统函数各子因式，画出各因式对应的幅度响应 $|Hk(e^{j\omega})|$；图：

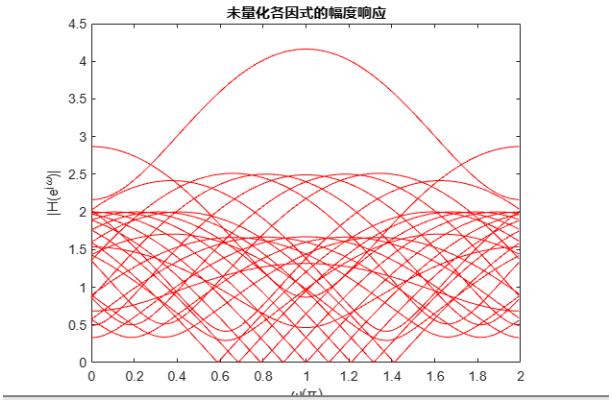

图 6:

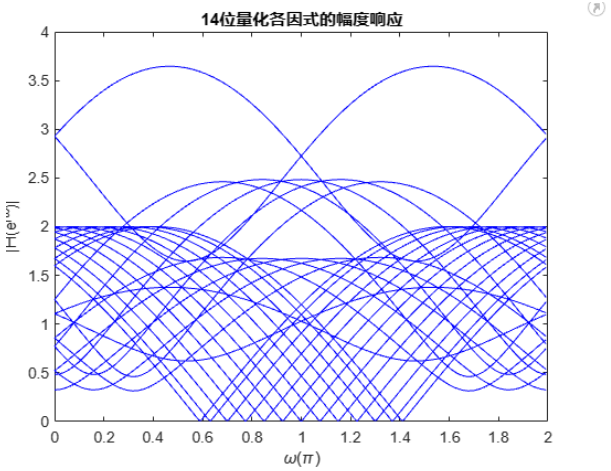

图 7:

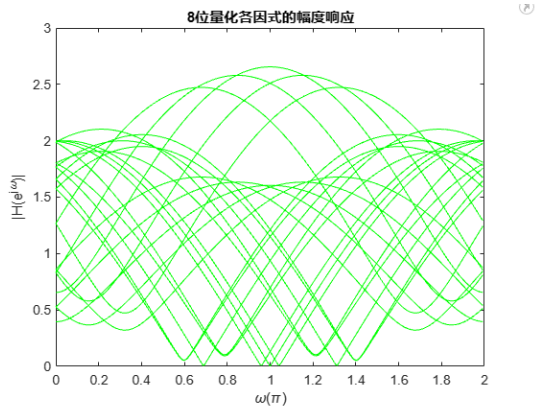

图 8:

```
%第四题
% no quantilize
figure;
clear title;

H_factor = zeros(27,256);
for i = 1:27
    [H_subfactor,w] = freqz([1 -zero_n(i)],1,256,'whole');
    H_factor(i,:) = H_subfactor';
end

for j = 1:27
    plot(w,abs(H_factor(j,:)));

    hold on;
end
title('未量化')

figure;
H_factor = zeros(25,256);
for i = 1:25
    [H_subfactor,w] = freqz([1 -zero_14(i)],1,256,'whole');
    H_factor(i,:) = H_subfactor';
end

for j = 1:25
```

```
    plot(w,abs(H_factor(j,:)));
    hold on;
end
title('十四位量化')

figure;
H_factor = zeros(25,256);
for i = 1:25
    [H_subfactor,w] = freqz([1 -zero_8(i)],1,256,'whole');
    H_factor(i,:) = H_subfactor';
end

for j = 1:25
    plot(w,abs(H_factor(j,:)));
    hold on;
end
title('八位量化')
```

5) 画出　生成的由 14 位量化各因式幅度响应合并的系统幅度响应 $|H14(e^{j\omega})|$，并与由中求得的系统函数直接获得的幅度响应进行比较，给出结论描述；图：

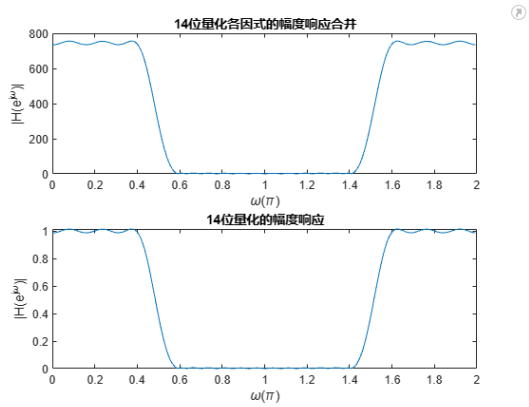

图 9:

```
H_factor_14_product = prod(abs(H_factor_14),1);
figure(7);
subplot(2,1,1)
plot(w/pi,abs(H_factor_14_product));
title('14位量化各因式的幅度响应合并');
xlabel('\omega(\pi)');
ylabel ('|H(e^j^\omega)|');
subplot(2,1,2)
[H_f14,~] = freqz(h_14bits,1,256,'whole');
plot(w/pi,abs(H_f14));
title('14位量化的幅度响应');
xlabel('\omega(\pi)');
ylabel ('|H(e^j^\omega)|');
```

6) 针对未量化系统，重做步骤 过程，并与 14 位量化幅度响应进行比较，并给出结论描述。

图：

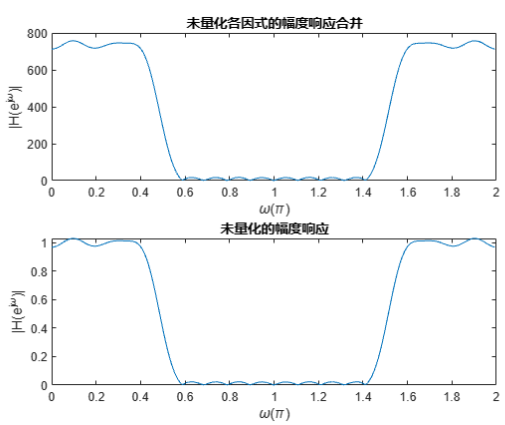

图 10:

```
%第六题
H_factor_n_product = prod(abs(H_factor),1);
figure(8);
subplot(2,1,1)
plot(w/pi,abs(H_factor_n_product));
title('未量化各因式的幅度响应合并');
xlabel('\omega(\pi)');
ylabel ('|H(e^j^\omega)|');
subplot(2,1,2)
[H,~] = freqz(h,1,256,'whole');
plot(w/pi,abs(H));
title('未量化的幅度响应');
xlabel('\omega(\pi)');
ylabel ('|H(e^j^\omega)|');
```
