5.44 Consider the following FIR transfer function.

$$H(z) = \sum_{i=0}^{20} \frac{z^{-i}}{1+i}$$

(a) Write a MATLAB script that uses *f_lattice* compute a lattice form realization of this filter. Print the gain and the reflection coefficients of the blocks.

(b) Suppose the sampling frequency is $f_s = 600$ Hz. Use *f_freqz* to compute the frequency response using a lattice form realization. Compute both the unquantized frequency response (set bits = []), and the frequency response with coefficient quantization using 8 bits. Plot both magnitude responses on a single plot using the dB scale and a legend.

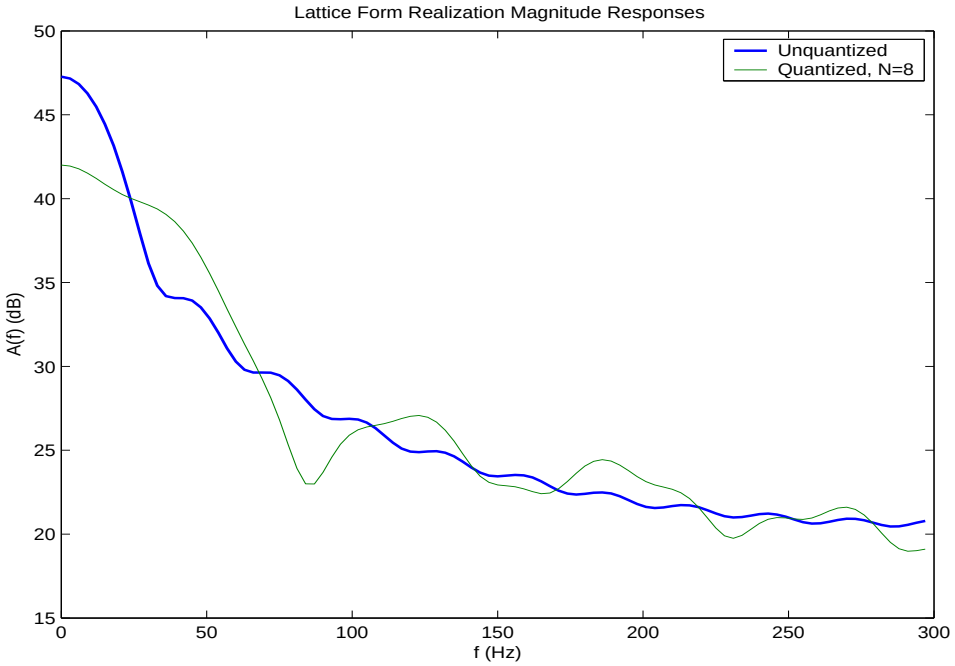
Solution

```
% Problem 5.44

% Initialize

clear
clc
m = f_prompt('Enter filter order',0,50,20);
for i = 1 : m+1
    b(i) = i;
end
a = 1;
fs = 600;
bits = f_prompt('Enter number of bits',1,64,8);
realize = 2;

% Compute lattice form coefficients

[K,b_0] = f_lattice (b);
K = K'
b_0

% Compare original and quantized magnitude responses

p = 100;
[H,f] = f_freqz (b,a,p,fs,[],realize);
[H_q,f] = f_freqz (b,a,p,fs,bits,realize);
A = 20*log10(abs(H));
A_q = 20*log10(abs(H_q));
figure
h1 = plot (f,A,f,A_q);
```

```
set (h1(1),'LineWidth',1.5)
f_labels ('Lattice Form Realization Magnitude Responses','f (Hz)','A(f) (dB)')
s = sprintf ('Quantized, N=%d',bits);
legend ('Unquantized',s)
f_wait
```

(a) The lattice form parameters are

```
K =
    0.5000
    0.3333
    0.2500
    0.2000
    0.1667
    0.1429
    0.1250
    0.1111
    0.1000
    0.0909
    0.0833
    0.0769
    0.0714
    0.0667
    0.0625
    0.0588
    0.0556
    0.0526
    0.0500
   21.0000
b_0 =
     1
```



(b) Lattice Form Magnitude Responses