8 DIGITAL FILTER IMPLEMENTATION

Example 15 Design cascade Butterword IIR filter realization defined by

```
b,a,v,u,C]=iirdes('but','p',[4000 5000 7000 8000]*pi/24000,0.01,0.001);
```

and plot its frequency characteristic by using standard frqresp function. Discuss the results[1].

Solution

```
POCET = 1000;                              % number of points used for drawing
% filter designed by PORAT package
[b,a,v,u,C]=iirdes('but','p',[4000 5000 7000 8000]*pi/24000,0.01,0.001);
% draw frequency response by PORAT package
h = frqresp(b,a,POCET);
plot(abs(h));                              % linear scale
pause

plot(20*log10(abs(h)));                    % logarithm scale
grid
pause

% design of cascade realization
[nsec,dsec] = pairpz(v,u);
format long
save nsec.dat nsec -ascii                  % save biquad sections
save dsec.dat dsec -ascii

m=max(size(nsec))                          % number of BIQUAD sections
% computation of frequency response as cascade of BIQUAD sections
hh = ones(1,POCET);
for k=1:m
% total response is product of individual BIQUAD responses
 hh = hh .* frqresp(nsec(k,:),dsec(k,:),POCET);
end
C                                          % scaling constant
plot(C*abs(hh));                           % linear scale
pause

plot(20*log10(C*abs(hh)));                 % logarithimc scale
grid
```

Example Check solution of examples from previous lesson

---

[1] Note that order of realized IIR filter is relatively large, so there are problems with round-off errors also in MATLAB environment