Homework 5 (Due: 20th Jan.)

(1) What are the roles of (a) admissibility criterion and (b) scaling function for continuous wavelet transform design? (10 scores)

(2) What are the vanish moments of (a) $\frac{d^{10}}{dt^{10}} e^{-\pi t^2}$ (b) the sinc wavelet, (c) the 12-point symplet, and (d) $H(f) = (1-\exp(-j2\pi f))^4 \cos^2(\pi f)/16$ where $H(f)$ is the discrete-time FT of the coefficients h_k on page 407? (20 scores)

(3) Why the complexity of the 1-D discrete wavelet transform is $O(N)$? (10 scores)

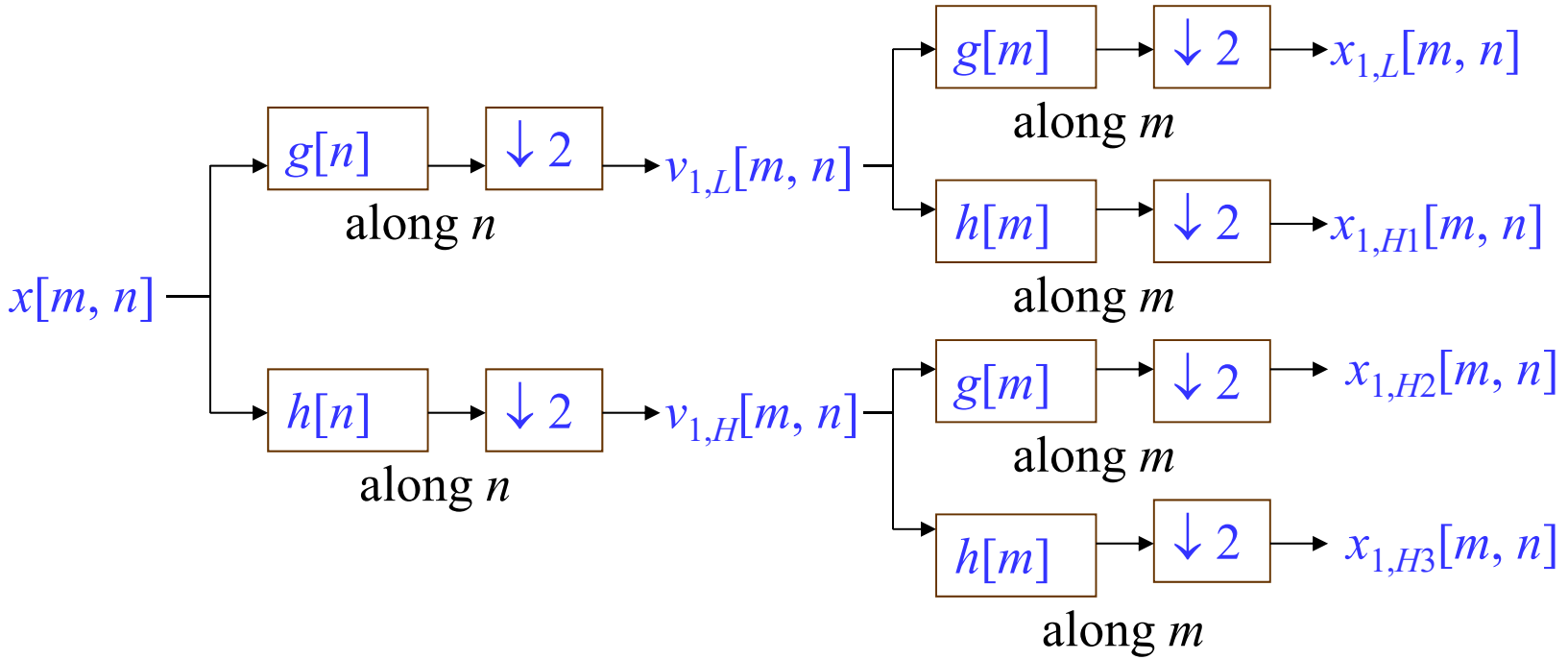
(4) Why the wavelet transform is useful for (a) adaptive filter design and (b) image compression? (10 scores)

(5) What are the advantages of (a) the symlet and (b) the coiflet compared to the Daubechies wavelet? (10 scores)

(6) For a two-point wavelet filter, if $g[0] = 4/5$, $g[1] = a$, and $g[n] = 0$ otherwise. Determine a if (a) $g[n]$ is a quadratic mirror filter and (b) $g[n]$ is an orthonormal filter. (10 scores)

(7) (a) Write a Matlab or Python code for the following 2-D discrete 10-point Daubechies wavelet.

[x1L, x1H1, x1H2, x1H3] = wavedbc10(x)



(b) Also write the program for the inverse 2-D discrete 10-point Daubechies wavelet transform.

x = iwavedbc10(x1L, x1H1, x1H2, x1H3)

The code should be handed out by NTUCool.

(30 scores)

(Extra): Answer the questions according to your student ID number.

(ended with 1, 2, 3, 4, 6, 7, 8, 9)