1 H-4.1

1.1 S1

These signals each use a different code, so it is code division multiplexing (CDM).

1.2 S2

The signals are transmitted on different frequencies, so it is frequency division multiplexing (FDM).

1.3 S3

These signals each have bumps at different times, so it is time division multiplexing (TDM).

2 H-4.2

S1,X
X sequence:
0, 1, 2, 3, 1, 1, 0, 2, 2, 3
bit sequence:
00 01 10 11 01 01 00 10 10 11

3 H-4.3

4 different rectangle signals with period T and 4 different amplitudes.
There are 4 differnt binary symbols [00, 01, 10, 11] and 4 signal numbers [0,1,2,3].
So there are $4*3*2*1 = 24$ ways to map the binary data to the signal numbers.

Sketch needed. Need to do Gram-Schmidt Procedure to calculate exact values for the signals. Number of needed orthonormal basis functions are obvious then.

4 H-4.4

Gram-Schmidt Procedure:

5 H-4.5

???

6 H-4.6

Not sure which basis function to remove. The options incremental and sorted-by-energy probably should influnce the desicion.

7 H-4.7

$M = 4$ $h = \frac{\delta f}{f_m} = \frac{1}{4}$???

8 H-4.8

???