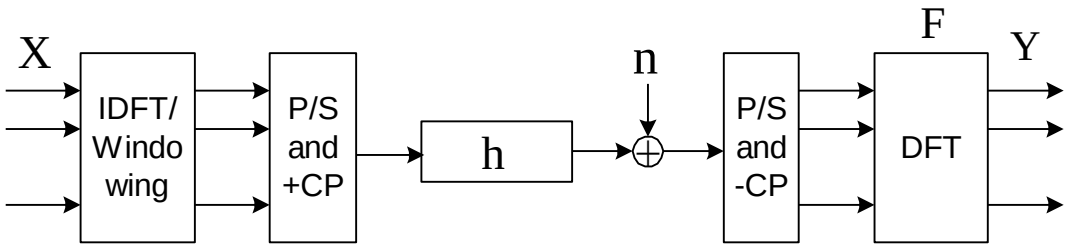
CO6066: Broadband Transmission Technology, 2026
Department of Communication Engineering, NCU
Homework #2

Prof. *Dah-Chung Chang*

Date: 2026/4/25, Deadline: 2026/5/7

A 16-QAM signal X, whose power is normalized, is transmitted with OFDM over the discrete-time channel model h which was considered in Homework #1. As depicted in the below figure, the transmitter (TX) is now equipped with an N-point IDFT and the receiver (RX) with an N-point DFT, along with adding cyclic prefix (CP) and removing CP removal, respectively. The complex AWGN n is set as 20 dB SNR. Suppose that N=256 and the length of CP is 32. Assuming the OFDM system works with perfect synchronization.



(a) Generate two pseudo random (PN) sequences for X, each with a length of 256 samples which are taken from {+1, -1}, and add them before the 16-QAM data with CP. The OFDM frame is depicted in the following figure. PN1 and PN2 are used for channel estimation now. Suppose the two PN patterns are known at RX. Use the least squares (LS) method to estimate the channel by averaging the results obtained individually from PN1 and PN2.

PN1	CP	PN2	CP	Data	CP	Data …

(b) Design a frequency-domain equalizer (FEQ) for the OFDM receiver (after Y). Plot the constellation diagram of the received 16-QAM signal for 100 OFDM data symbols.

(c) Plot the BER curves of the 16-QAM demodulation results with channel #1 and #2 for SNR ranged from 0dB to 30dB (spaced with 2 dB).

You have to deliver your report briefly documenting your methods, equations, simulation results, and discussions along with simulation codes.