

Notations and Assumptions

This document may be updated periodically, and lists some common assumptions and notations that may be required on homework, and exam questions.

- If you believe that to answer a given question, additional assumptions must be made, state your (reasonable) assumptions, and proceed to answer the question. If you believe that a question cannot be answered even with reasonable additional assumptions, explain why.
- Channel model 1 consists of the following assumptions:
 - Log-distance path loss model with path loss exponent of 3, and path loss at $d_0 = 1$ meter being 20 dB.
 - Noise spectral density $N_0/2 = 4 \times 10^{-21}$ W/Hz.
 - Bandwidth $W = 1$ MHz.
 - Note that, in this model, channel gain for the channel between a given pair of nodes is identical in both directions.
- $d(X, Y)$ denotes distance between nodes X and Y.
- **Network 1** consists of 4 nodes A, B, C, D located along a straight line, in that order, with $d(A, B) = 10$ m, $d(B, C) = 100$ m, $d(C, D) = 20$ m.
- *Utility* of a flow is a non-decreasing function of the flow rate. Network utility is defined as the sum of the utilities of all the flows in the network.