

Homework 07

ECE/BME 351 - Probability and Statistical Analysis for Engineers



Date: 04/10/2025

Due data: 04/30/2025

Section: Learning, clear/concise presenting, and applying new knowledge

Question (01): SO7-Learn: KPI - 7.1 (sources) and 7.2 (applies)

- (1) [SO7.1] In the classroom, you learned about digital multiplexing with the T-carrier hierarchy used in North America by leveraging time division multiplexing (TDM). In this question, you are asked to extend your knowledge on digital multiplexing by investigating about a current state-of-the-art multiplexing hierarchy by using your knowledge acquired when learning the foundations of the T-carrier hierarchy.

Synchronous Optical Networking (SONET) is a North American standardized protocol used to multiplex multiple digital bit streams synchronously over optical fiber using lasers. Explore and self-study about SONET and their importance use-cases in modern communication systems. Present your acquired new knowledge through this investigation in the form of a brief technical report (maximum of two letter-sized pages). Make sure to cite all references/sources that you will be using to acquire new knowledge on this topic.

- (2) [SO7.2] Apply your new knowledge acquired from the investigation in Part (1) to answer the following questions:
- (a) Describe the Synchronous Transport Signal Level One (STS-1) by sketching its frame structure and calculating its output bit rate.
 - (b) Explain the channel structures of STS-3, STS-12, STS-24, STS-48, and STS-192. Clearly indicate the bit rate of each of these STS levels.