

CME 451 Assignment 1 (Due: January 22, 2016)

Solution Sketch

Note: in the following you will find not full solutions, but instead sufficient hints towards the full solutions. When appropriate, pointers to appropriate lecture slides are provided in parentheses. When in doubt, feel free to contact the teaching assistant or the instructor for further help on your assignments.

0. Read chapters 1, 2 and 3 in the textbook.
1. **(C01 – Slide 7)** Discuss distortions due to air. Discuss how convenience and ubiquitous communications became a deciding factor.
2. Justify answer based on specific applications, noting that air is the medium for several (often drastically different) wireless communications systems.
3. Answer varies. The Institute of Electrical and Electronics Engineers is a non-profit organization, responsible for various standards, conferences and publications relevant to this course (and beyond).
4. **(from article in Question 3)** Discuss relationship to resulting refractive index.
5. **(from article in Question 3)** Discuss material dispersions and waveguide dispersions.
6. SMF or MMF: determined by physical dimensions, and profile of indices of refraction. See Figure 2.1.
7. LED and laser are the two main light sources for fiber optic systems. Similar behavior when spontaneous emission dominates (at low forward bias current).
8. **(C02 – Slide 14)** Discuss forward vs. reverse bias requirements.
9. **(C02 – Slide 9, Slide 21)** Provide lower-bound answer, by assuming best-case attenuation (e.g., 0.2dB/km) and straight-line distance.
10. **(C03 – Slide 5)** Discuss problem of ISI.
11. **(C02 – Slide 28)** Calculate power density with typical parameters for an SMF fiber, and discuss non-linear effects.