CME 451 Assignment 2 (Due: February 6, 2017)

Completed assignments must be submitted on the specified due date by 4:30pm in the CME451 assignment box (second floor, across Room 2C94E). Late assignments will not be marked, and will be given a mark of zero.

Marking scheme:

- 30% completion mark
- 70% based on a selected set of problems below

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0. Read chapters 3 and 4 in the textbook.
1. What is the suitable wavelength range for transmission with WDM, and why?
2. What type of symbol modulation scheme would be needed to achieve an optical capacity of 75 Tb/s. Show all calculations.
3. Consider an ITU-type channel spacing scheme. What should be the reference frequency if a wavelength separation of 0.8 nm is equivalent to 110-GHz channel spacing?
4. Suppose you are the network engineer working on a long-haul link between Saskatoon and Toronto (you may assume a distance of 2300km). Design your system to achieve a required capacity of at least 24 Gb/s.

   For this design, you are given the following components (rated for 4 Gb/s):

   a. Laser source: output power 1mW and spectral width 0.75nm.
   b. APD receiver, with input sensitivity of 1 μW
   c. Optical fiber: 1550-nm wavelength band with attenuation loss of 0.35 dB/km.
   d. SMF dispersion of 1.5ps/(nm km)
   e. O-E-O regenerator that can recover 0.40 of the data eye.
5. In a particular application, the network cables have a high probability of being accidentally cut. Discuss how WDM and SONET address this situation.
6. Draw a typical STS-1 frame format. Be sure to specify the frame duration.
7. To achieve the goals of the overall SONET network, two supporting networks are needed. Explain the rationale for and describe the design of these networks (Hint: see Fig. 4.6).

8. What options for multiplexing are available in SONET? Discuss when each should be selected?
9. In terms of bandwidth, how many STS-12 frames are equivalent to an STM-256 frame?
10. Compare SONET and SDH frames in terms of overhead. What implications can be drawn from this comparison?
11. Describe the types of clock variations typically encountered in SONET.