

# CS 4390: HW 3

Written by Zach Leach, NetID: zcl190002

Draft February 20, 2024

## 1 Data Rate Problem

It is desired to send a sequence of computer screen images over optical fiber. The screen is  $3840 \times 2160$  pixels, each pixel being 24 bits. There are 60 screen images per second. What data rate is needed?

$$\text{Data Rate} = \frac{\text{Number of bits}}{\text{Bits per second}}$$

There are  $24 \text{ bits} \cdot (3840 \times 2160) = 199,065,600$  bits per image. Transmitting 60 images per second gives a data rate of data rate is  $60 \cdot 199,065,600 = \underline{1.194 \cdot 10^{10} \text{ bits per second}}$ .

## 2 FDM Multiplexing Problem

Ten signals, each requiring 4000 Hz, are multiplexed onto a single channel using FDM. What is the minimum bandwidth required for the multiplexed channel? Assume that the guard bands are 400 Hz wide.

$$\text{Bandwidth} = [\# \text{ of channels} \cdot \text{channel bandwidth}] + [(\# \text{ of channels} - 1) \cdot \text{guardbandwidth}]$$

3

4

5

6

7