EECS 562

Homework 3

1. In TDM why is frame synchronization needed and what is its cost?

2. A TDM system has a frame time = T_f= 10 ms. The frame is divided into 20 time slots. Each time slot carries 1344 bits. (These are some LTE parameters).

a. What is the slot time in ms?

b. What is the T_b=bit time in μs?

c. What is the total bit rate in Mb/s?

d. What is the minimum transmission bandwidth?

e. Suppose a user gets 4 time slots, what is the user bit rate (in b/s)?

3. Explain TDMA?

4. Explain TDD?

5. Consider the use of TDM for the transmission of 80 video channels. Assume each channel is bandlimited to 4.0 MHz.

a. What is the minimum sample rate for each signal?

b. What is the time between samples?

c. What is the frame time?

d. TDM/PAM is used, what the symbol rate, assuming the minimum sample rate for each signal was used?

e. What is the minimum bandwidth required for a TDM/PAM signal?

f. Find the minimum bandwidth for a TDM/PAM signal required when each video signal is sampled at 9,000,000 samples/sec.

g. Find the minimum bandwidth required when TDM/PCM is used with 8 bits/sample and 9,000,000 samples/sec.

6. Your company has baseband spectrum of 1 MHz. How many users can be supported using the following multiplexing techniques? Each user has a baseband bandwidth of 20kHz. Clearly state any assumptions.

a. TDM/PAM

b. TDM/PCM with 8 bits/sample

c. Using the number users found in part c. find the additional bandwidth needed if a 1010101010101010 bit pattern is used in the first time slot to obtain frame synchronization.

7. TDM is used to send 2048 voice signals, each signal is sampled at 8000 samples/sec with 8bits/sample

a. What is the TDM bit rate?

b. If raised cosine pulse shaping is used with α = 1 what is the required bandwidth.