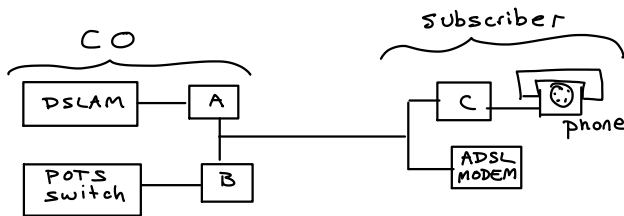


Assignment 2

Due Tuesday April 21. Show your work. Hand in your assignment using the appropriate dropbox on the course web site. Assignments submitted after the solutions are made available will be given a mark of zero.

Question 1

The diagram below shows an ADSL system identify the frequency responses of the filters A, B and C assuming an ADSL1 system with non-overlapping up and down-link frequency ranges.



Question 2

Find the numbers of the ADSL channels that would overlap the frequencies used by an AM radio station operating with a center frequency of 690 kHz and a bandwidth of 15 kHz? Take into account the bandwidths of both the AM radio signal and the ADSL subcarriers.

Question 3

An OFDM system uses a sampling rate of 10 MHz and an OFDM block sizes of 128 samples. What is the subcarrier spacing? What range of subcarriers would you use to obtain a signal bandwidth of just under 6 MHz? Calculate the resulting bit rate if subcarrier 0 (zero) was not used and 16-QAM modulation was used the other subcarriers (up to 6 MHz)?

Question 4

What is the maximum coverage area, in km^2 , of a PON system using transmit powers of 0 dBm, re-

ceiver sensitivities of -27 dBm, ideal 32-way splitters and optical fiber with a loss of 0.3 dB/km.

Question 5

A PC sound card claims to use a 18-bit A/D converter with a sampling rate of 96 kHz.

- What is the theoretical quantization SNR assuming a triangle waveform?
- If the signal power is 100 mV RMS, what is the quantization noise voltage?
- What is the highest frequency that could be digitized without aliasing?
- What is the highest frequency that humans can hear?

Question 6

Impulsive noise is causing errors on a T1 link used to carry telephone channels. The noise impulses are 100 ns long and happen every 25 μs . How many speech channels will be affected by the noise?