**DATA TRANSMISSION**

1. *CONCEPTS AND TERMINOLOGY TRANSMISSION*

Data transmission occurs between transmitter and receiver over some transmission medium in the form of electromagnetic waves. Transmission media can be classified as follows.

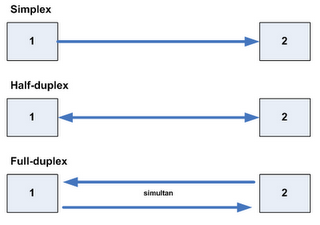
1. Media cable also called guided media, the waves in the media is controlling the physical path to the recipient data.

Example: fiber optic, twisted pair, and coaxial cable.

1. Media cordless (wireless) is also called unguided media, these media provide a means for transmitting sound, but not control it.

Example: propagation (propagation) in the air and sea

A transmission have methods of operation in the shipping process signals, which are divided into three kinds, namely:

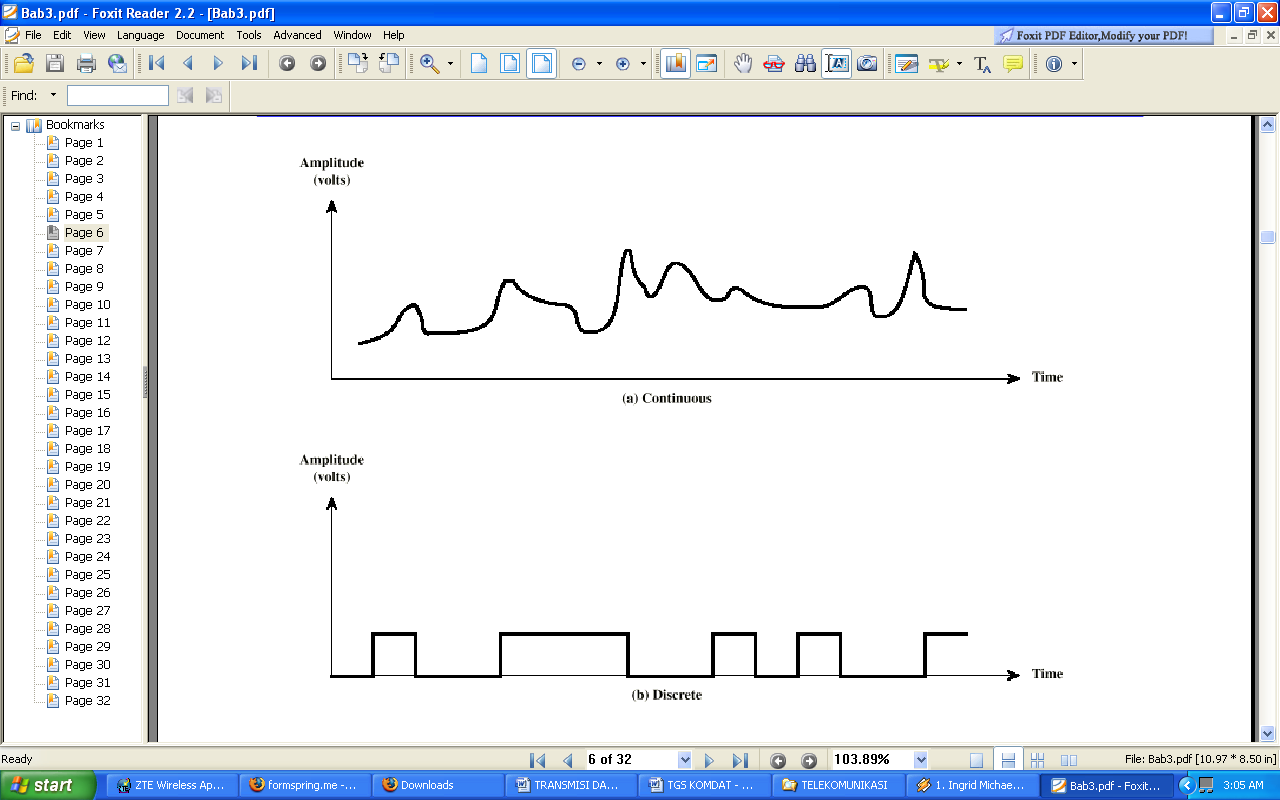
1. Simplex, the data is transmitted only unity directions, one station as a transmitter and the other as a receiver. Example: broadcast television or radio broadcasts.
2. Half duplex, data is transmitted in both directions alternately, the time required to change the direction of data transfer. Example: chatting, texting, walkie talkie.
3. Full duplex, data can be transmitted in both directions simultaneously. Example: phone, hand phone.
4. *FREQUENCY, SPECTRUM, AND BANDWIDTH*

Concept of Time Domain , When seen in function of time, an electromagnetic signal can be:

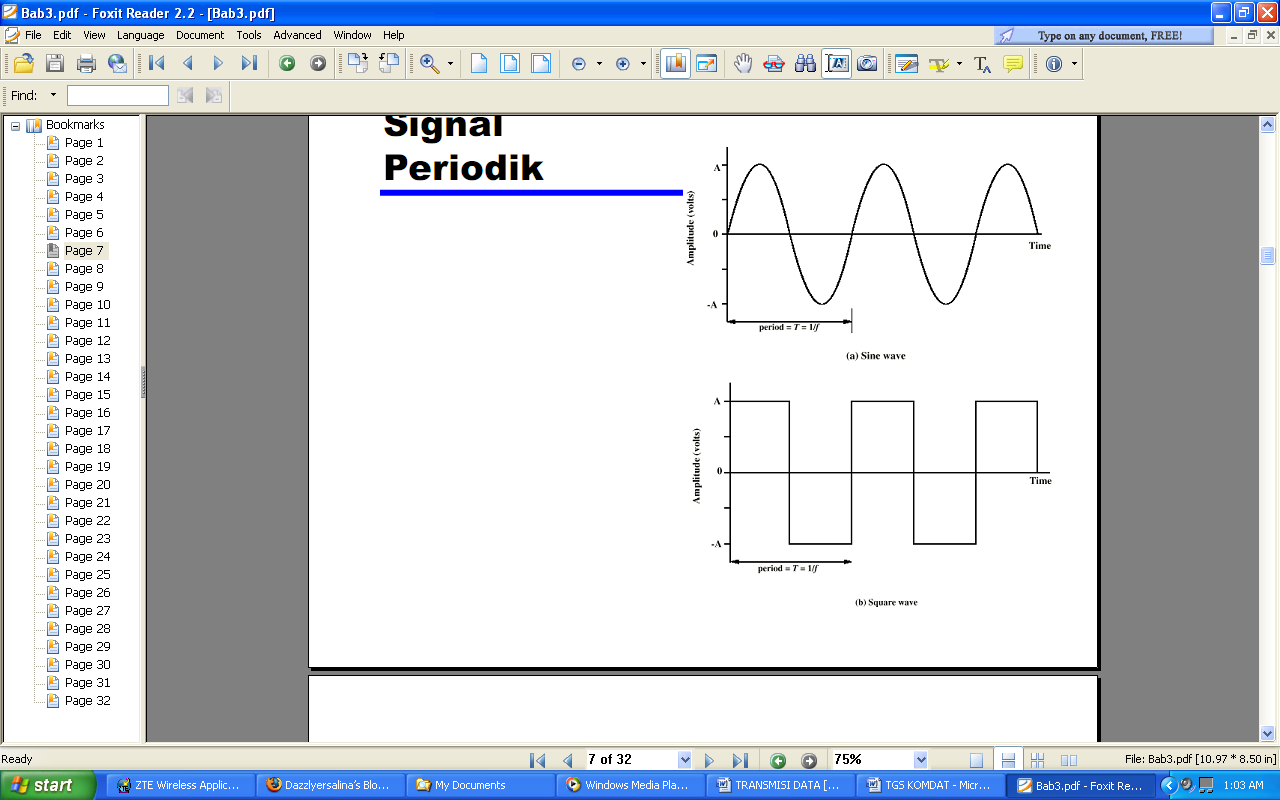
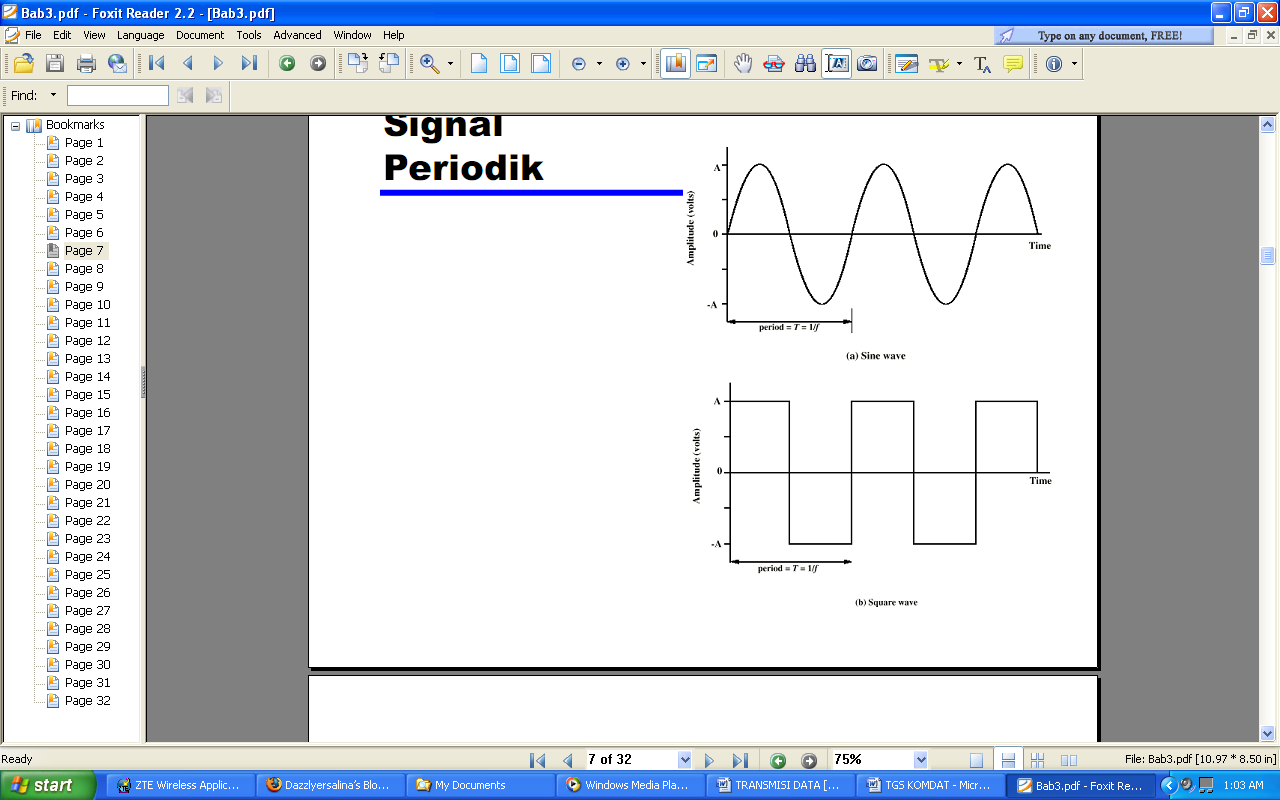
1. Continuous signal is a signal which varies in intensity in fine shape all the time, no signal is lost. This

signal describes the conversation.

1. Diskrete signal is a signal in which the intensity to maintain a constant level for some period of time then changes to another constant level. This signal describes a binary 1 and 0.
2. Periodic signal is a signal that recur in a certain time interval that has a repeating pattern.
3. Aperiodic signal is a signal that doesn’t show the pattern of repetition each time and it looks random.

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*Continuous Signals and Diskrete*



*Periodic signals*

Periodic sine wave is a fundamental signal, can be described by three parameters, namely:

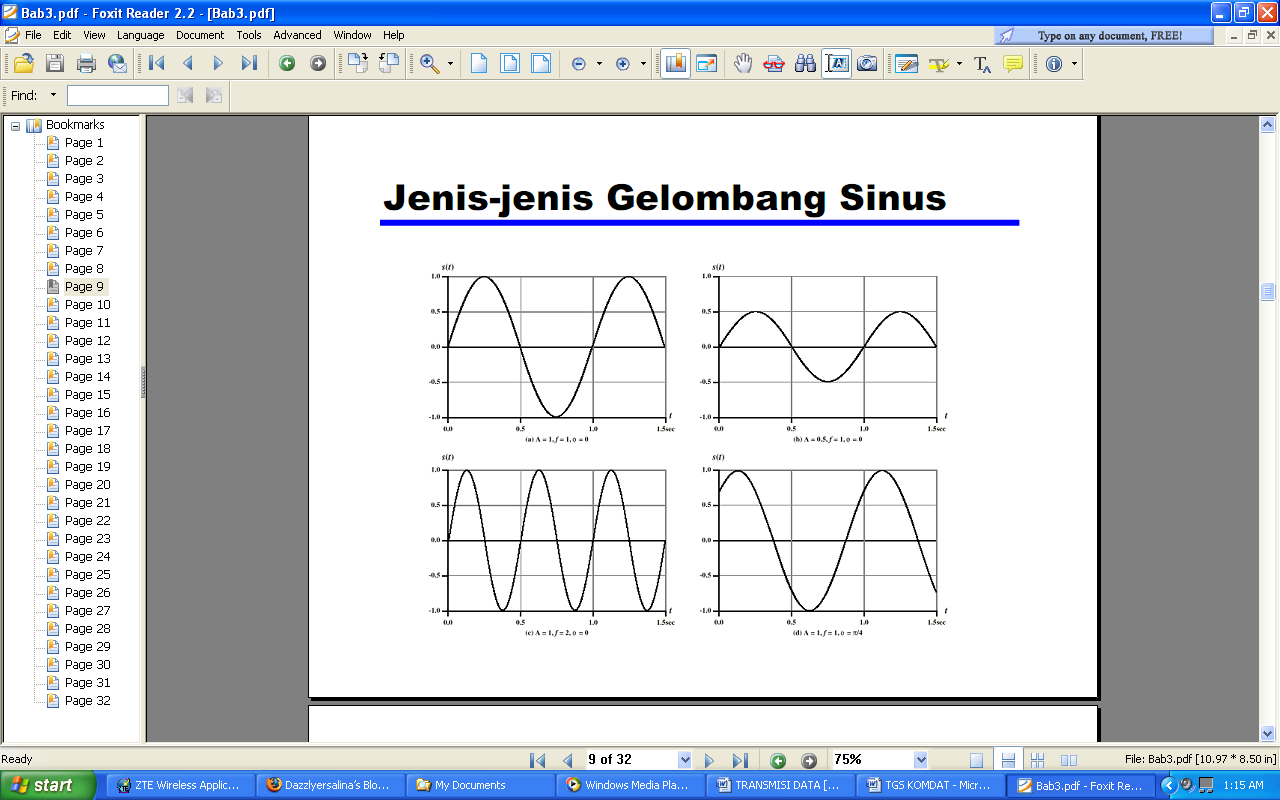
1. Peak amplitude (A) is the highest value or the signal strength at any time. Typically

measured in volts.

1. Frequency (f) is the rate (in cycles per second, or Hertz [Hz]) in which the signal

is repetitive.

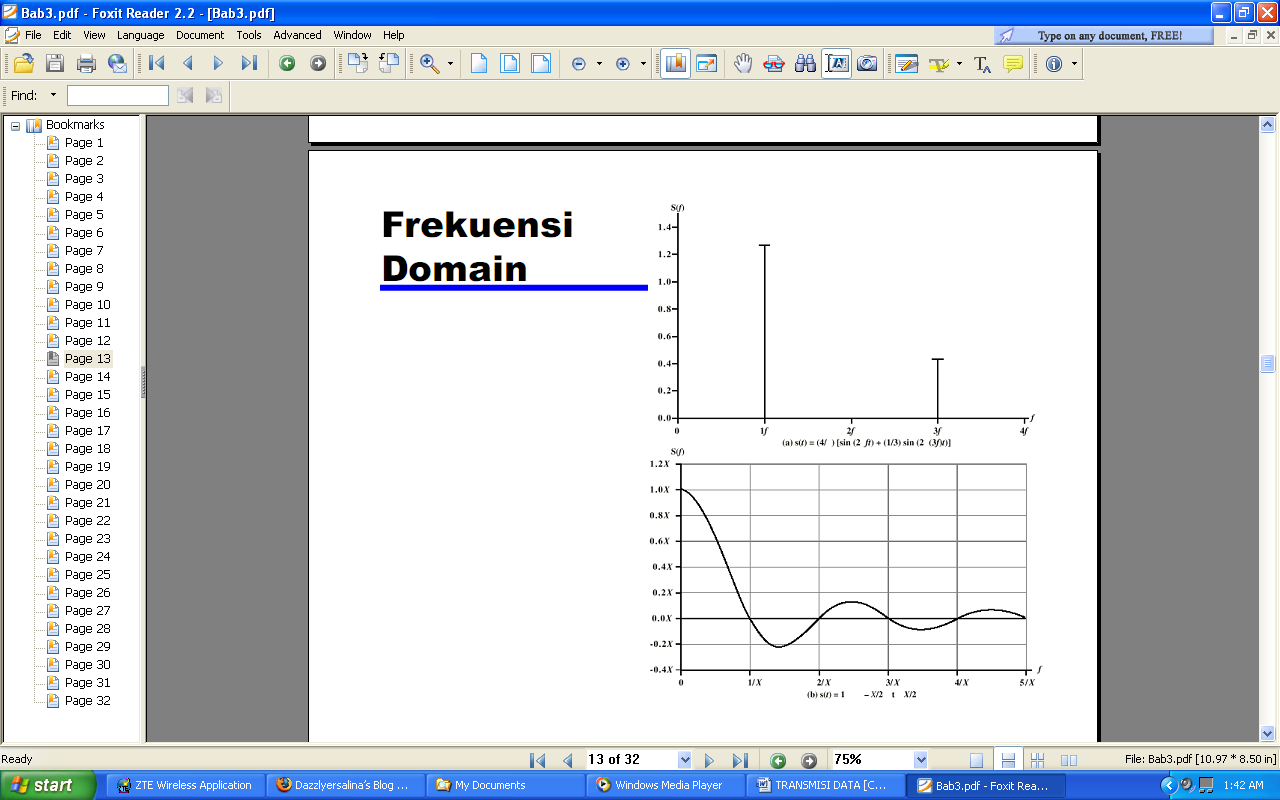
1. Phase (ø) is a measure of the relative position at a time in one signal period. Sine waves can be formulated as follows.**s (t) = A sin (2πft + ø)**



*Sine Wave*

1. *FREQUENCY-DOMAIN CONCEPTS*

An electromagnetic signal is formed from the various frequency components, each component is called sinusoids. Each signal has a frequency of domain function S (f), which determines the peak amplitude of the signal frequency consistent.



*Prequency – Domain*

*SPECTRUM AND BANDWIDTH*

1. The spectrum is the distance or range of frequencies containing the signal.
2. Absolute bandwidth is the width of the spectrum.
3. Effective bandwidth is the width of the narrow frequency spectrum where more and more energy.
4. DC component is constant component whereby if a signal includes a component of zero (0) which is a direct current (dc).

*THE RELATIONSHIP BETWEEN DATE RATE AND BANDWITCH*

Direct relationship between the data rate with the higher bandwidth data rate is a signal, the greater the effective bandwidth. Viewed in another way, the greater the bandwidth of a transmission system, the higher the data rate that can be transmitted through the system.

*ANALOG AND DIGITAL DATA TRANSMISSION*

a. Data

Data are entities that convey a meaning or information. Data can be analog data and digital data.

1. Analog data, accept values ​​ongoing and continuous in some interval. Example: audio and video.
2. Digital data, receive different values. Example: text or characters and integers.

b. Signal

Signal is electrically view data or electromagnetic. While signaling is physically distributing signals through an appropriate media. Signals can be either analog signals and digital signals.

1. Analog signals are electromagnetic waves diversity continuous which can be spread through various media, depending on the spectrum. Example: the sound, the music.
2. A digital signal is a sequence of voltage pulses that can be transmitted through a cable media: for example: a constant level positive pulse is shown as a binary 1 while a negative voltage level constant with binary 0. Example: The data stored in a CD or computer memory.

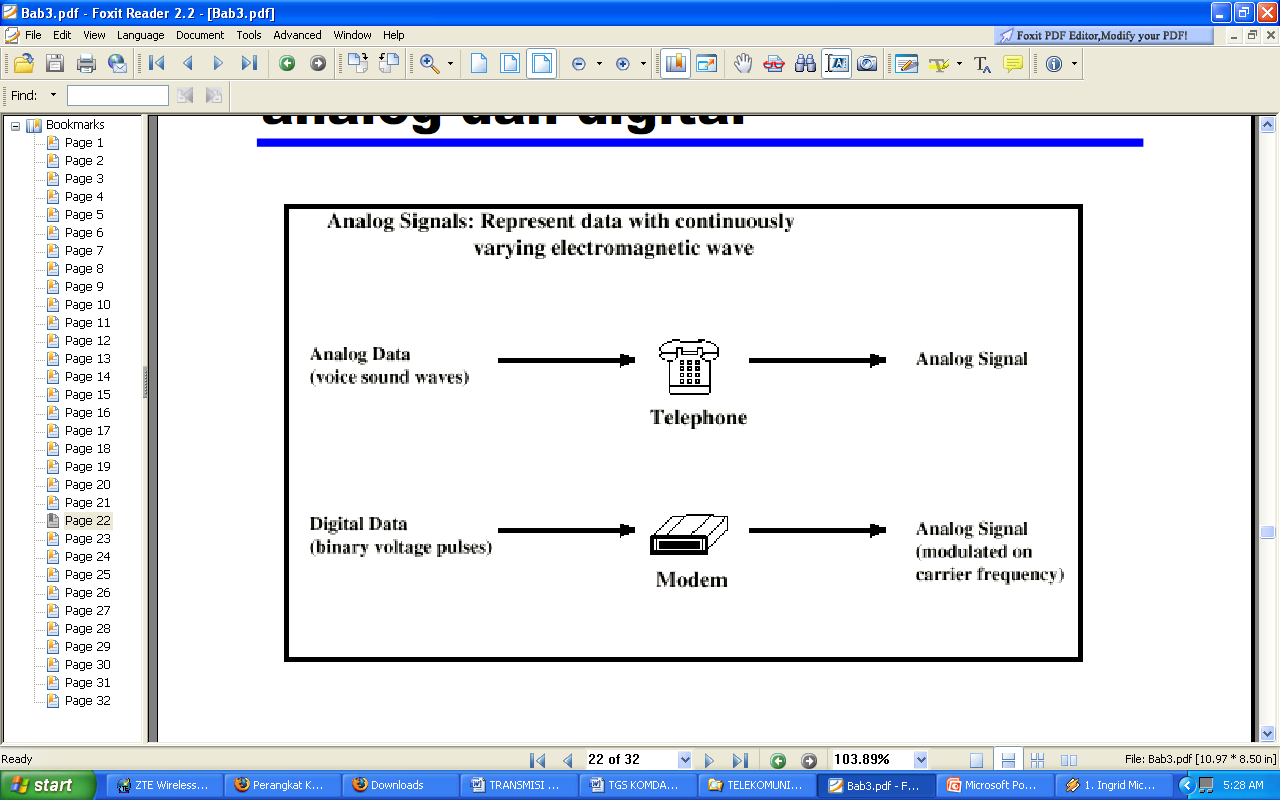
c. Data and Signals

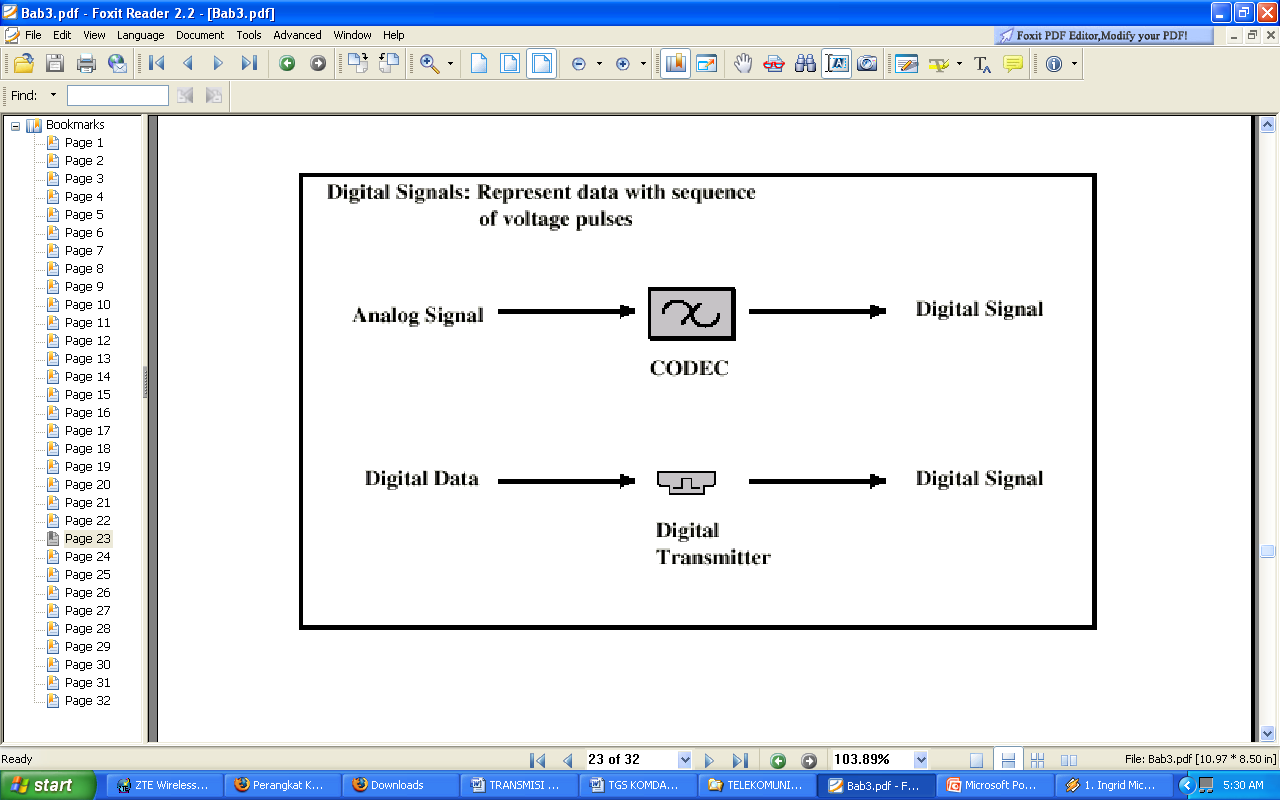
The analog signals can be used to display analog data, and digital signals to display digital data. Analog data is a function of the frequency spectrum of the time and place limited, such data can be displayed via electromagnetic signals that occupy the same spectrum. While digital data carried by digital signals, with different voltage levels for each of the two binary digits.

Digital data can be carried through analog signals, such as the modem (modulator-demodulator). Similarly, analog data can be generated through the digital data, such as the codec (coder-decoder).

1. Transmission

Transmission is through the deployment of data communication and processing signals.





*Analog and Digital Signaling*

Analog transmission is an attempt to transmit analog signals without regard to their contents. The signal can display analog data (eg voice) or digital data (eg, binary data across a modem).

Digital transmission is the transmission of the effort associated with the charge of the signal can be transmitted at a certain distance before attenuation, noise, and other disturbances that jeopardize the data integrity. In order to achieve a sufficiently large distances, repeaters are used. A repeater receives a digital signal, regaining pattern 1 and 0, and re-transmit the signal and then then atuensi overcome.

The advantages of digital transmission and digital signaling techniques is as follows.

1. Digital Technology

Technology LSI / VLSI causes a decrease in the cost and size of digital circuitry.

1. Data Integrity

More far-reaching even the low quality.

1. Use Capacity

Economical high bandwidth and a high level of multiplexing.

1. Security (Security) and Privacy (Confidentiality)

Encryption techniques can be applied easily.

1. Integration

Can process digital and analog data in the same way.

*INTERRUPTION OF TRANSMISSION*

In a communication system, the received signal may be different with the transmitted signal due to various transmission impairments. For analog signals, interference can degrade the signal quality. As for the digital signal, bit error will appear: binary 1 is converted into a binary 0 and so on.

Disorders of the most significant are as follows:

1. Attenuation and Attenuation Distortion

Attenuation is the decrease in signal strength, often occurs when the distance is too far through the transmission medium. For guided media, the attenuation is a more complex function of the distance and generally followed the logarithm function. So usually expressed as a constant number of decibels per unit distance.

Attenuation presented three considerations for building transmission:

1. The received signal must be strong enough so that the flow of electronic signals on the receiver can detect.
2. The signal must maintain a level higher than the noise received without error.
3. Attenuation is an increasing function of frequency

The first and second problems can be solved by using a signal with sufficient strength and amplifiers or repeater-repeater. The third problem, the technique used to flatten the attenuation over a frequency band and amplifiers that amplify high frequencies than low frekuesi.

2. Delay Distortion (Distortion Delay)

Delay distortion is a phenomenon that occurs due to the speed of the spread of signals through different guided medium frequencies that arrive at the receiver at different times.This effect is critical for digital data created from signals with frequencies different, because some components of the signal from one bit position will spill (spill over) to the position of the other bits, causing intersymbol interference.

3. Roar

Noise signals which are not expected in the event of a data transmission. Noise caused by the modification of various distortions, plus additional signals unwanted inserted somewhere between transmission and reception.

Noise is divided into four categories:

1. Noise temperature is a thermal electron turbulence that appears in all electronic devices and

transmission media, and is a function of temperature.

1. Intermodulation Noise is merging signals of different frequencies but uses the same transmission medium.
2. Crosstalk is a signal of a relationship to be heard by others.
3. Impulse noise is interference pulses irregular, breaking the sound on the short duration and relatively high amplitude.

4. Channel Capacity

Channel capacity is the maximum rate at which the data can be transmitted over a given communication path or channel and in certain circumstances.

There are four concepts, namely:

1. Data Rate, is the rate in bits per second (bps), the data is communicated.
2. Bandwidth is the bandwidth of the transmitted signal at the transmitter and is forced through a transmission medium, expressed in cycles per second or hertz.
3. Noise, an average noise level along the lines of communication.
4. Error rate, is the rate in which the error occurred, which received an error when forced to 1 when 0 is transmitted or received at 0 when 1 is transmitted.