EERI423 ST2 Flash Cards

Describe and compare different types of multiplexing

1)Broadly define Multiplexing

1) Multiplexing is the process of simultaneously transmitting two or more individual signals over a single communication channel, cable or wireless.

2)Name 2 basic methods of multiplexing

2)

- Frequency Division Multiplexing
- Time division Multiplexing

3)Briefly describe each of these methods

3)

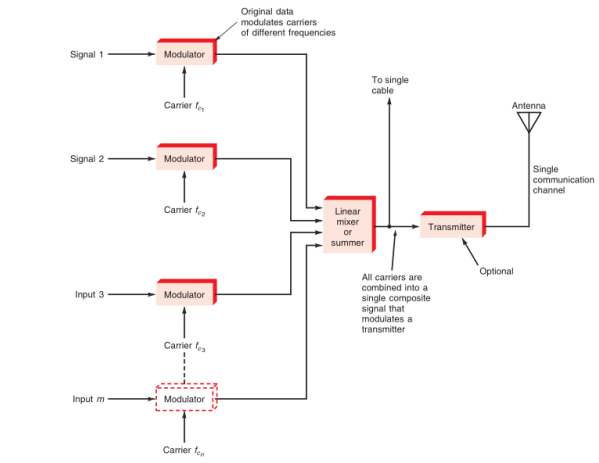
- FDM divides a channel's bandwidth into several narrower bands, and assigns each multiplexed signal one of these bands
- TDM Allows each signal to occupy the entire channel bandwidth for a brief time.

4)In words, describe the black diagram for a FDM multiplexer

4) Each channel is modulated by its own modulator, using a unique carrier. These modulated signals are then summed and transmitted

5)Draw the block diagram for a FDM multiplexer

Figure 10-2 The transmitting end of an FDM system.



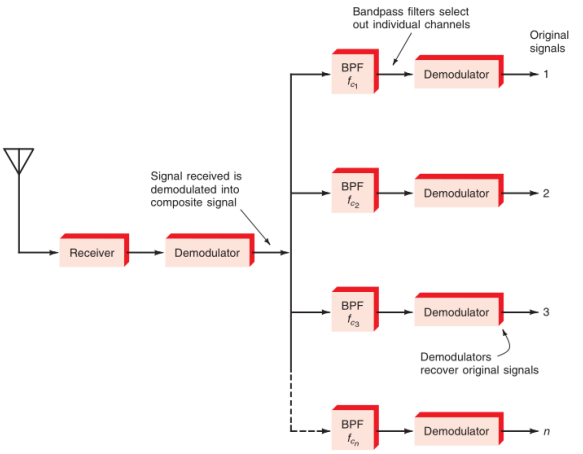
5)

6)Explain the block diagram for an FDM demuxer in words

6) The first demodulator recovers the composite signal as output by the summer. For each output, the signal is passed through a bandpass filter centered aroun the unique carrier, before demodulating the signal to Recover each original input

7)Draw the block diagram for an FDM demuxer

Figure 10-4 The receiving end of an FDM system.



7)

8)List 3 applications for FDM

8)
- Telemetry
- Cable TV
- FM Stereo Broadcasting

9)In TDM, what is produced by simply sampling each input for a short time

9) PAM

10)How was PAM achieved in early telemetry systems

10) By making use of a commutator switch

11)What is a commutator switch

11) A basic mechanical switch that rotates an arm to touch different contacts one after the other

12)Which two constraints dictated the design of such a switch

12) The speed of rotation and duration of contact

13)briefly explain the operation of a TDM demuxer

13) The signals are recovered using synchronized clocks and low pass filters

14)what is the most popular form of TDM

14) PCM

PCM IGNORE, DELETED

1)Define PCM

1) Pulse code Modulation

2)What is the main constraint of PCM

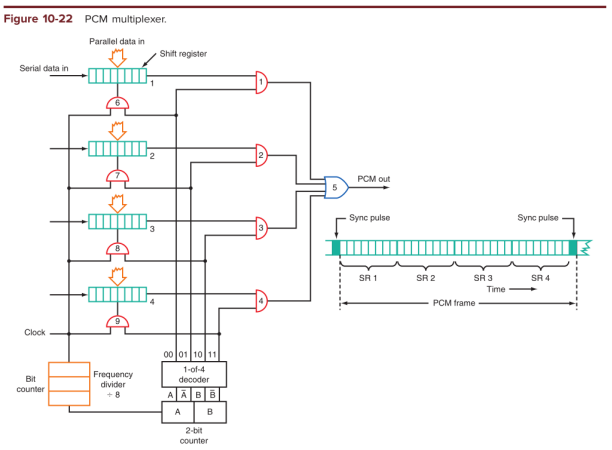
2) It cannot transmit Analog data, so ADC's have to be used

3)In words, describe the block diagram of a PCM muxer

3)
- ADC's are used, if the input is analog
- A Digital MUX circuit receives the digital inputs, as well as decoded clock pulses
- This signal is transmitted

4)Draw the block diagram of the Digital Muxer in the above block diagram

4)



5)List x advantages of PCM

5)

- Reliable
- Inexpensive
- Resistant to noise

  All pulses have the same amplitude

  Frequency, phase shape, etc. do not effect the demuxing, since only a pulse needs to be identified

Explain the relationship between bandwidth and bit rate

1)What are the 2 most common media used for electronic communication

1) Radio and Wire Cable

2)What constrains the bandwidth of a cable

2) The physical charachteristics of the cable

3)How does this limitation work

3) All cables act as low pass filters because they have inductance, capacitance and resistance

4)What is the typical bandwidth of a coaxial cable

4) 200-300MHz for smaller cables and 500 MHz to 50 GHz for larger cables

5)What is the typical bandwidth of a Twisted pair cable

5) from a few Kilohertz to over 800Mhz

6)What constrains the bandwidth in free space

6) The amount of bandwidth allocated by the governing body(ICASA) in south africa

7)What Law relates the information capacity of a channel to the bandwidth

7) Hartley's law

8)State this law, in its most basic form

8) $C = 2B$ Where C is the capacity in bps and B is the bandwidth in Hertz

9)What is the limitation of the law in this form

9) It assumes only 2 encoding levels are used, i.e. High=1 and low=0

10)State the law so that it allows for more encoding levels

10) $C = 2Blog_2N$ Where N is the number of encoding levels

11)What is the implication of this form of the law

11) That More encoding levels enable a higher bit rate over the same bandwidth

12)What is the limitation of this second form of this law

12) It ignores noise, implying that more encoding levels are always better

13)State the law in a form that takes noise into account

13) $C = Blog_2\left(1 + \frac{S}{N}\right)$Where $\frac{S}{N}$ is the SNR *As a ratio, not as DB*

Explain the operation and benefits of spread spectrum

1)Define wideband Modulation

1) To occupy more bandwidth than the information signal with the modulating signal

2)What are the 2 most widely used methods to achieve wideband modulation

2) Spread spectrum and Orthogonal Frequency division multiplexing

3)Briefly discuss the development of spread spectrum

3) After WW2, it was developed by the military for security and immunity to jamming

4)Name 3 common applications of SS, and state which is the most common

4)
- LAN and PC modems
- A class of cordless telephones
- Cellular telephones(Most common)

5)Name the 2 basic methods to apply spread spectrum

5) Direct Sequence and Frequency hopping

6)List 5 advantages of Spread spectrum

6)
- Security
- Resistance to jamming and interference
- Band Sharing
- Resistance to fading and multipath propagation
- Precise timing]i

7)Briefly explain the operation of a frequency hopping SS transmitter

7) The serial binary input is mixed with a frequency that is dictated by a Pseudorandom code generator

8)What is meant by pseudorandom

8) A binary sequence that repeats after many bit changes, which is random enough to prevent someone accidentally duplicating the code, but predictable enough to be duplicated at the receiver.

Define the Characteristic of radio Waves

1)Which 3 attributes of radio waves describe the way the waves interact with obstacles

1) Reflection , refraction and diffraction

COME BACK TO THIS ONE

Calculate the signal strength of a radio wave at a given point

It is important to do several examples here 1)State the formula for power density at a given distance from a poins source

1) $P_d = \frac{P_t}{4\pi d^2}$ Where: P_d = Power density; P_t = power transmitted; and d = distance

2)What is the limitation with this formula

2) Power density is not as usable a figure as power received

3)State the formula that overcomes this

3) $P_r = \frac{P_t G_t G_r \lambda^2}{16\pi^2 d^2}$ Where:

- λ: Signal Wavelength
- d: Distance from Transmitter
- P_r, P_t: Received and transmitted power, respectively
- G_r, G_T: receiver and transmitter antenna gains expressed as a power ratio and referenced to an isotropic source

4)question

4) answer

use various channel models, and propagation equations to determine the communication range

1)State the formula for calculating the maximum communication distance for line of sight propagation

1) $d = \sqrt{17h_t} + \sqrt{17h_r}$ where:

- d is the maximum communication distance in km
- h_t, h_r are the heights of the TX and RX antennae

Name and describe the components of conventional electrical telephones

1)Name the 5 basic components that connect a long distance phone call

1)

- The first telephone set
- Local loop 1
- Long distance system
- local loop 2
- Second telephone set

2)Name and describe the 5 parts of a basic telephone set

2)
Ringer Bell or oscillator that rings
Hybrid Transformer that converts signals from the four TX and RX lines to a signal suitable for a single twisted pair. The hybrid performs the full duplex comms on the twisted pair
Hook Switch Switch usually actuated by the handset that isolates the telephone from the central office loop
Dialing circuits Circuits that enable the telephone to dial specific numbers
Handset Contains a mic and speaker for the user

Describe the hierarchy of telephone signals using a block diagram

1)To what is a residential line connected

2)And to what is this entity connected

3)If the call is long distance, what is the next step, and where is this connection

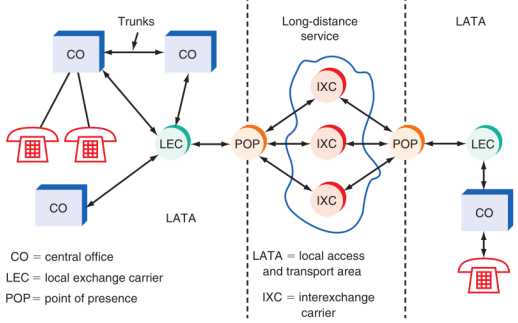
4)draw the diagram that illustrates the heirarchy of telephone signals

1) A central office

2) A local exchange carrier

3) The LEC connects to in IXC(interexchange carrier) at a POP (Point of persistence)

Figure 18-12 Organization of the telephone system in the United States.



4)

Describe a common second generation cell phone

1)How did the very first cell phone communicate

2)What name is given to the first Digital cell phones?

3)Which 2 classes of 2g phones are in use today

4)Which multipexing technique do these systems empoy

1) Using analogue FM techniques

2) Second generation, or 2G phones

3) GSM and CDMA

4)
GSM Time division multiplexing
CDMA Spread Spectrum

5)State and describe the 3 basic parts of a typical 2G handset

5)

RF section Modulates and demodulates the digital baseband signal

Baseband section Performs DSP in the base band and performs A/D and D/A conversions

Control Houses HMI, RAM etc and controls other 2 sections.

Describe the block diagram architecture of a 3G cell phone

Describe the architecture and operation of a GSM cellular network.

1)Why is a GSM network called a "Cell network"

1) Because base stations form the heart of the network, and are configured in a cellular fashion

2)

2) answer