Quiz

On OSI networking layer model.

Previous Quiz

April 12th on oscillators.

Question 1

What are the two major reactive components that work in unison to determine a basic oscillator's frequency? Inductor and capacitor. Reactive is the key word. What do you think of? The two types of reactance are capacitive and inductive.

A diode is a piece of N-type material and a piece of P-type material mashed together. Junction acts like two plates of a capacitor, which is how we have a varactor diode. Change reverse bias voltage on the diode, get a capacitance. If increase the depletion region, what happens to the capacitance of this capacitor? Capacitance is the dielectric constant times the area of the electrodes divided by the thickness of the dielectric. So, increasing the depletion region decreases the capacitance. Any diode can act as a varactor diode, but they don't have the range that a varactor diode has.

AFC on FM radios. Turn it on once tune in a station and would track the station. Used a varactor diode.

Can use non-reactive components like an RC circuit.

Question 2

The two components in #1 above can be replaced by a single component. What is the name of this component? A piezoelectric crystal. A much better device as far as frequency control with respect to frequency changes. More expensive. Chances of getting exactly the frequency you need off the shelf is low.

Question 3

A certain type of feedback is necessary to cause an oscillator to oscillate. What is this feedback called? Positive. Other one is negative. What do we use negative feedback for? Controls oscillations to keep from oscillating. Amplifiers use negative feedback to prevent oscillation. Positive feedback fed back in phase, negative feedback fed back out of phase.

Question 4

Name three active devices that any one of which can be used in an oscillator. What are active devices? Something that can control. Transistor, vacuum tube. Some diodes can act as an active component. Also JFET, MOSFET.

Question 5

The tickler coil is used to mutually induce a voltage into what in order to sustain oscillation? Into another inductor, the main inductor that is part of the LC circuit that establishes the resonant frequency of the oscillator.

Question 6

Oscillators generate what types of output waveforms? Sinusoidal, trapezoid, sawtooth, square, triangle.

Question 7

What is the purpose of an oscillator? To create and sustain alternating current at a desired frequency or frequencies (fundamental plus harmonics).

Question 8

What type of circuits use oscillators? (ex. Color CW generator) Heterodyning circuits in receivers (the local oscillator). Horizontal and vertical sync circuits in NTSC receiver. Stage of FM receiver that receives the pilot and syncs the local oscillator. Beat frequency oscillator in single sideband receiver. Test signal generator circuits. Transmitters and frequency converters.

LC circuit can be a filter or part of an oscillator, depending on how they are used. Often schematics will label oscillators as such.

Sometimes gates can be hooked up as oscillators. How to identify that? Usually drawn in familiar form. A flip-flop. See the characteristic X crossover of each gate's output going to the other gate's input in a pair of gates. Must use NOR or NAND gates to make a flip-flop. Output will be a square wave. Control the oscillator with resistors and capacitors. Not a good idea to use capacitors in digital circuits unless careful; a differentiation of a square wave results in a positive-going spike and a negative-going spike. Must remove the negative-going spike else will burn out the digital components. Use a diode to remove the negative-going spike. The bigger the capacitor within the flip flop circuit (tied to the input of one of the gates fed by the output of the other gate, bypassing to ground through the capacitor and a resistor). Integrating is OK (unless the voltage goes too high).

Lots of different oscillators. More useful on an engineering level. Can find circuits on the world wide web.

Next Quiz

On MPEG-2 compression. On Thursday.

Review

One question on the final asks what will see on the screen if take a camera and dolly in while zooming out, both at the same rate to keep the subject in the same place. The background will look like it is moving while the subject looks like they are stationary. This is called dolly/zoom.

Homework

See http://monsterfm.com/tv/tvcheck.html

Contains FCC TV broadcast station self-inspection checklist.

Section 1 – administration and non-technical.

Go through each section, look at subparts A that gives you the FCC rule and the rule number. Here, would have to find out what principal control point means. Reword the checklist questions/answers to turn them into statements, and define the things that are not readily defined. No simple cut and paste. There are 95 questions on that web page.

Due Tuesday. Remind Steve not to assign additional homework on Thursday.

Handout

This would have been a quiz.

Circuit is an encoder. Encoding NTSC composite video signal from a number of major input signals: R, G, B, subcarrier, sync, burst flag, blanking. Also clamp pulse.

There are equal amounts of RD, BL, and GR. What appears out of the balanced modulator? Nothing. FCC rules say that no subcarrier should be transmitted when no color is present in the video signal.

The subcarrier feeds the balanced modulators as well as a 57 degree angle. What is the purpose of this block? It gets fed into a two-input AND gate along with the burst flag. Burst flag is the switch that turns on and off the AND gate. Why is it shifted 57 degrees? 90 – 33 is 57 degrees. Puts this signal on the I axis. The 90 degree shift goes to the R-Y modulator. What's another clue this is the R-Y modulator? The 1.5 MHz bandpass filter (marked LPF 1.5 MHz). Subcarrier starts at 180 degrees out of phase. The 90 degree shift goes to R-Y axis. The 57 degree shift goes to I.

If have .30R + .59G + .11B and equal amounts of R, G, and B. The Y formula applied in a separate area, separate from the color matrix.

This tells us that it is an I and Q modulator. Since burst is shifted by 57 degrees, and is used as a reference for color, this shows that the R-Y and B-Y signals will be interpreted as I and Q since the reference is shifted away from its normal phase of 180 degrees.

Uses low value resistors to sum the various signals together into a common summation point.

Why is there a delay in the R-Y line? The filters take time since they have time constants, so the R-Y filter must be faster.

What do we use matrixes for in high definition TV? What do we generate with the matrices? Not I and Q. We stay with R-Y and B-Y.

Having I and Q may have been a mistake. PAL doesn't have I and Q and there aren't any complaints about color.

Clamping

Clamping done because absolute voltages lost on a video signal when it passes through a coupling capacitor. Usually clamp at the back porch, where at blanking level (0 volts). Use a large enough capacitor so that it won't gain that much voltage at line rate (63.5 microseconds). Often use a FET as the switch to enable clamping since it presents a high impedance when not conducting.

Beam Splitter and 3 CCDs

Splits into R, G, and B. What level? One volt. We have analog RGB signals coming out of the CCDs. Then they are matrixed to get Y, R-Y, B-Y. What do we do with these? Convert analog to digital by sampling.

What do we do to turn it into SDI video? Sample the voltages at what rate? Sample luminance at 13.5 MHz, sample R-Y and B-Y at 6.75 MHz each. Take a 10-bit value at each sample. Put through a shift register to transform parallel data into serial data. 27 MHz times 10 = 270 megabits per second. Clock rate is half this rate (135 Mbps).

How do we use vector scopes on digital video? Don't have subcarrier phase, but have X and Y coordinates from B-Y and R-Y, respectively. Electrostatic control of CRT in vector scope and oscilloscope. Plates 90 degrees away from each other.

Why run 601 in the studio? For all the things we want to do to video, including switching, editing.

601 is 4:2:2.

First step of MPEG compression is converting 10-bit 4:2:2 to 8-bit 4:2:0.

What determines synchronization on SDI? EAV and SAV.

What happens first in encoder? DCT (discrete cosine transform). Selects an 8 by 8 block for transformation.