EE207 coursework 1

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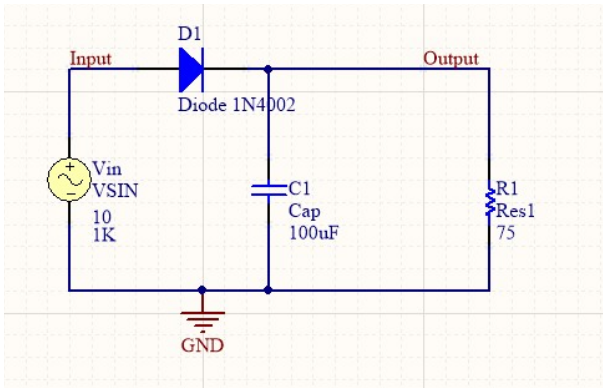
Introduction

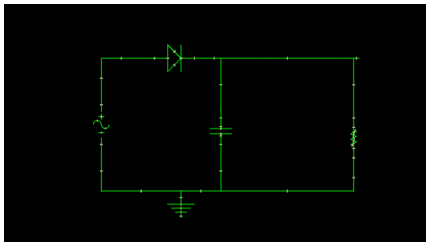
Electronic design automation (EDA) is the software used to design and model integrated and printed circuit boards on a computer. Software to design circuit boards has been around since 1981 before that circuits were designed on paper which was a lengthily and error prone method. Electronic design automation provides many benefits to engineering some being that it includes simulation systems to test the circuit you have designed for any errors such as short circuiting or over voltage. The EDA also incorporates component libraries which include components such as diodes and resistors. The SPICE simulator is the base of most EDA programs. it is used to check the integrity of circuit designs and predict circuit behaviour. When running the circuit for the first time there will be a netlist compiled which is a list of the components and how the nodes are connected to one another. Any errors found in the netlist will appear in the error message box and the circuit will not execute until they are fixed. Altium includes a netlist simulation as you can see in the screenshots below, the voltage is measured in these but resistance or current can be measured as well with the built-in oscilloscope and mustimeter. This is useful because you can see how the components react when voltage applies. By using EDA it allows you to save time and money because you don't need to spend money prototyping and damaging components you also don't have to wait for parts to arrive as you can download libraries for specific components you need in your circuit. Altium offers simulation for transistors, logic, hardware emulation, technology CAD. EDA minimises the time in designing complex integrated circuits and eliminates manufacturing errors reducing the manufacturing costs. The design of the integrated circuit can be optimized and simplified to get the most out of the space.

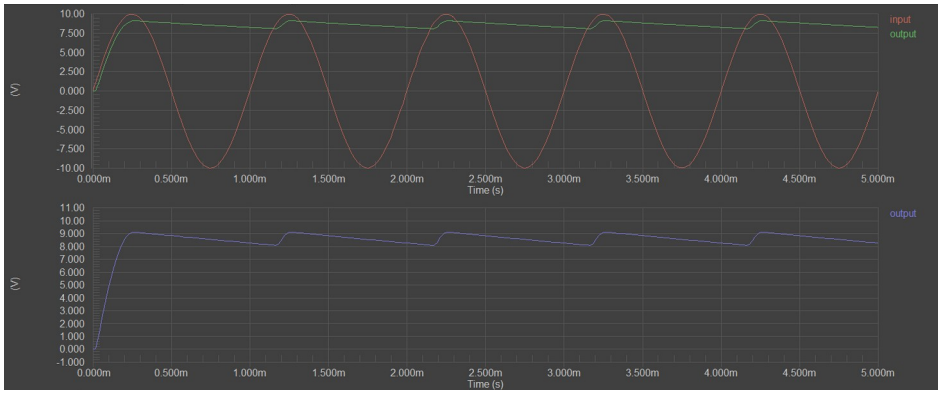
Week 2

Half wave rectification

This circuit is a form of rectifier that only allows one half cycle of an AC voltage waveform to pass while not blocking the other half of the cycle. The diode in the circuit (D1) 1N4002 prevents EMF and the current going in the wrong direction. The capacitor(C1) works as a filter to convert the pulsating DC to pure DC. The resistor R1 restricts the current flow to a certain level. Net labels names "input" and "output" are used when running the transient analysis. The top input shows the input values where the line varies from 10V to -10V making a constant waveform. The output below it shows a line ranging from 9V to 8V this is the capacitor charging and discharging.



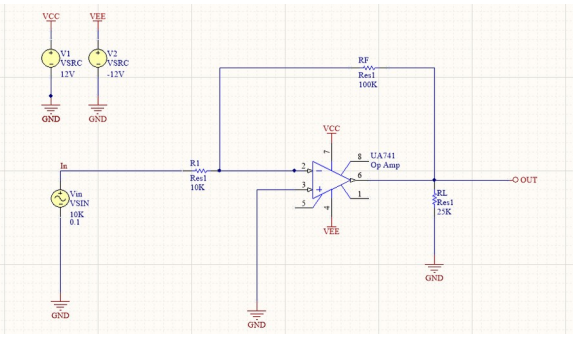


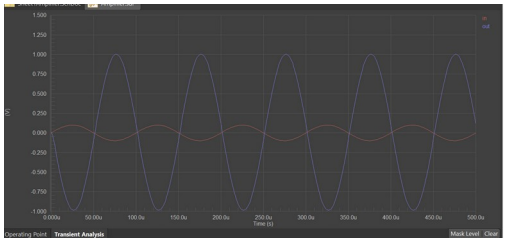


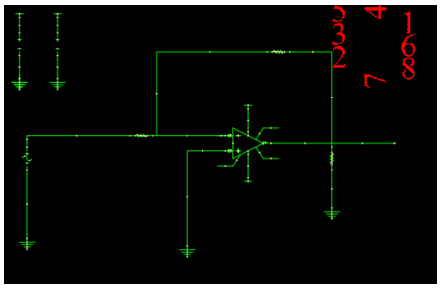
Week 4

Inverting amplifier

This circuit is known as an inverting amplifier because it takes the input AC 0.1V signal and amplifies it when it passes through the UA741 Op Amp that is supplied with -12V and 12V DC. The analytical lines can be seen on the graph below where red indicated the IN net and the blue line indicated the OUT net. From the graph you can see how the line amplifies from a low voltage change going into a higher voltage output. This circuit for an inverting amplifier could be used as a trans resistance amplifier which converts current to voltage where it is ideal for low power-based applications or a circuit that requires a low output impedance and level of gain. The circuit contains a VSIN input this component produces the sine wave gets amplified from 0.1V to 1V.



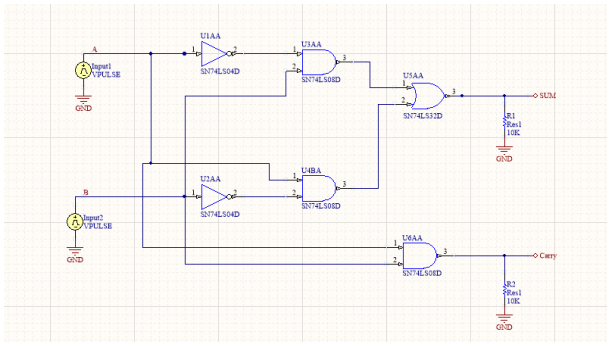


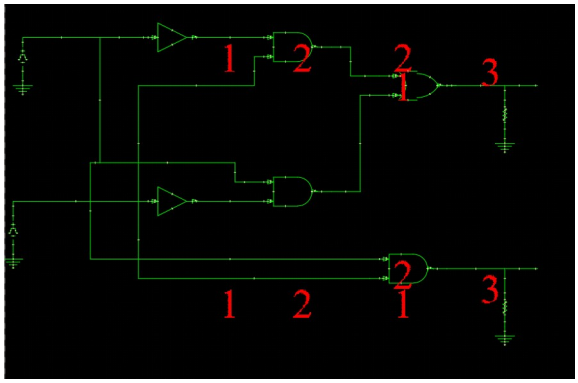


Week 5

Digital adder

The digital adder is a circuit which contains logic components from the TI library it uses NOT gates (SN74LS04D), OR gates(SN74LS32D) and AND gates(SN74LS08D). Its purpose is to perform addition of numbers. These are used in arithmetic units in processors to add binary numbers. The circuit can be more easily understood by the net labels of A, B, Carry and Sum . a and b are the numbers which are being added there are only two values a binary digit can have 1 or 0, 1 is indicted by a higher voltage of 5V 0 is indicated by the voltage being 0V. the carry is used for any remainders and the SUM is the final value produced of the two numbers added together, this can be easily viewed by the transient analysis screenshot.

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