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Week 9 Studio 1

Group 4b

15th Octorber 2019

**Activity #1: Non-inverting comparator**

1.

|  |  |  |  |
| --- | --- | --- | --- |
| S. No | Vin | Vref | Vout(single power supply) |
| 1 | +2.5V | 0V | +8V |
| 2 | +3.5V | +3.75V | 0V |
| 3 | +1.25V | -0.5V | +8V |
| 4 | -3V | -1V | 0V |
| 5 | -2.5V | +2.5V | 0V |

2. When a dual power supply is used, Vout values of Vin > Vref remain unchanged at +8V but Vout values of Vref > Vin decreases from 0V to -8V.

4. Vref = 0V as it is connected to the ground

5. The output waveform is a square wave with a 50% duty cycle. It does tally with the expected output as when Vin > Vref, Vout is saturated at 8V and when Vref > Vin, Vout is saturated at -8V

6. We can connect V+ = 8V and Vref via a 10kΩ resistor, and Vref­ to the ground via a 1kΩ resistor such that by Potential Divider Rule, Vref = 8 =

7. The output waveform is still a square wave but the time for Vin > Vref  will decrease and the time for Vref > Vin will increase. Thus the time spent on Vout = +Vcc = +8V will decrease and the time spent on Vout  = -Vcc = -8V will increase, while the period of the square wave remains unchanged

**Activity #2: Active low pass filter**

1. Vout = (1+)V+

= 1+ = 1+10000/10000 = 2

5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S. No | Frequency(Hz) | Vin(V) | Vout(V) | Gain(Vout/Vin) | Gain in dB |
| 1 | 200 | 1.6 | 3.4 | 2.1 | 6.5 |
| 2 | 500 | 1.6 | 3.4 | 2.1 | 6.5 |
| 3 | 1000 | 1.6 | 3.4 | 2.1 | 6.5 |
| 4 | 1500 | 1.6 | 3.4 | 2.1 | 6.5 |
| 5 | 2000 | 1.6 | 3.0 | 1.9 | 5.5 |
| 6 | 3000 | 1.6 | 2.6 | 1.6 | 4.2 |
| 7 | 5000 | 1.6 | 2.2 | 1.4 | 2.8 |
| 8 | 10000 | 1.6 | 1.4 | 0.9 | -1.2 |
| 9 | 20000 | 1.6 | 0.8 | 0.5 | -6.0 |
| 10 | 50000 | 1.6 | 0.6 | 0.4 | -8.5 |

6.

7. From the graph, when dB = 6.5 – 3.0 = 3.5, cut-off frequency ≈ 4000Hz

8. fc theoretical = = = 4080Hz

9. C = = = 20.4nF