name：Liangkai Li
FZU number：832002126
MCU number：20123337

name: Shipei Zhang
FZU:832002114
MU: 20122110

Title: The Operational Amplifier

Lab 5

introduction

EQUIPMENT
Power supplies
741 Op- Amp
Assorted Resistors
Function Generator
Digital Multimeter

OBJECTIVE

Preliminary study of the use of OP-AMP, using. 741 OP AMP to build op-AMP circuit.

content

Part1

circuit diagram
fig 1

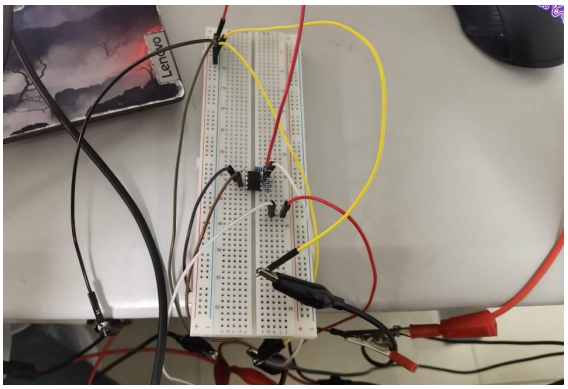
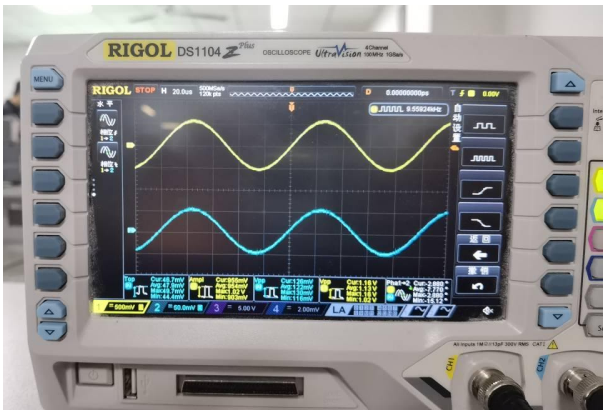


fig 2

f = 10 kHz

fig 3



R 2 = 10 kΩ .

The blue line represents the input signal and the yellow line represents the output signal.

As can be seen from Figure 2, VPP of the output signal is equal to 2*VPP of the input signal, that is, the amplitude of the two is equal. The phase difference between the two is about 2 degrees, meaning the two signals are in same directions.

As can be seen from Figure 3, when replacing a resistor whose R2 is 10K ω ,We change the input to 0.12V. the calculated gain should approach 11. The VPP of the output is 1.2 volts, which is actually 10 times the input. The phase difference is still 2 degrees. In other words, it fits the theory

From the view of waveform, the output signal and input signal waveform is consistent, are sine waves

This circuit is called the in-phase proportional circuit.

Part2

circuit diagram

Fig4

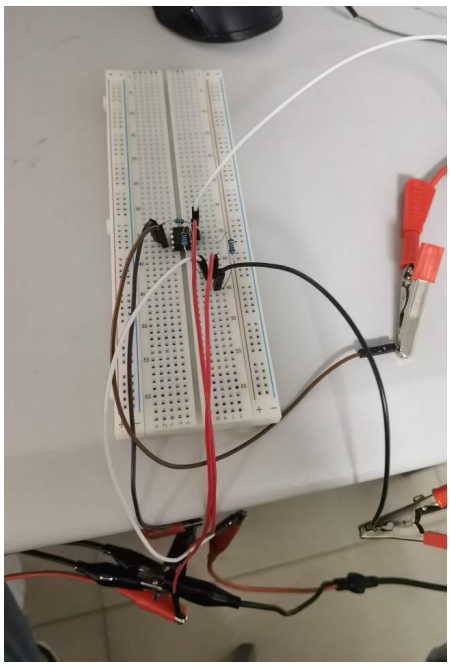
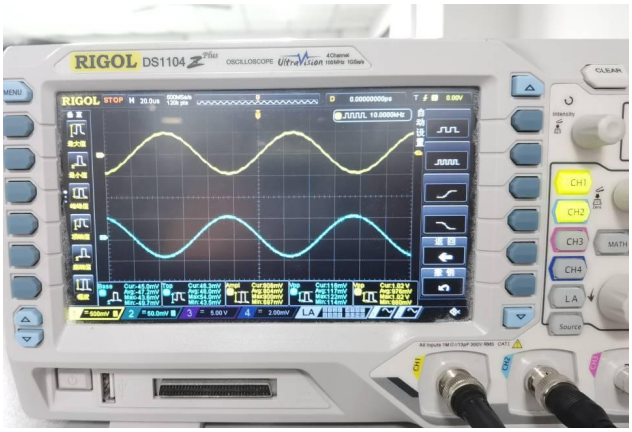


Fig5



Input signal is still blue line, output signal is yellow line. When the input Vin1 is sinusoidal voltage with Vpp of 1V and Vin2 of 5V, the output voltage is Vmax=7.5V and Vmin is sinusoidal signal with Vpp of 1.4V. The phase is opposite to the input signal Vin1. That is, the output signal becomes the reverse of the sum of the two inputs. And， We can see that Vout=Vin1+Vin2.

This circuit is an addition circuit

.

Part3

circuit diagram

Fig 6

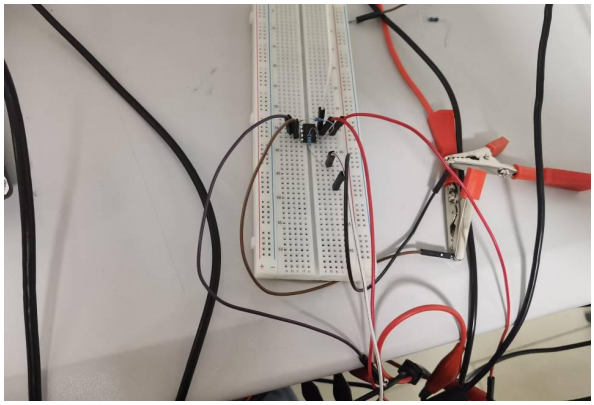


Fig 7

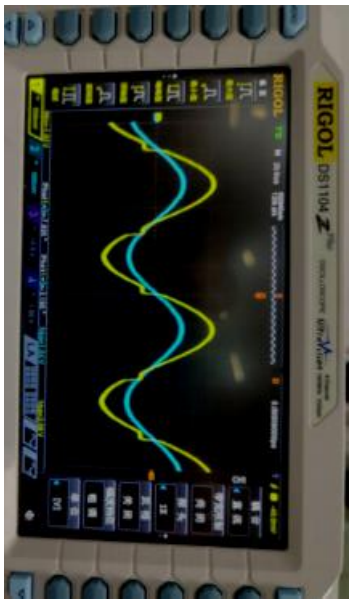
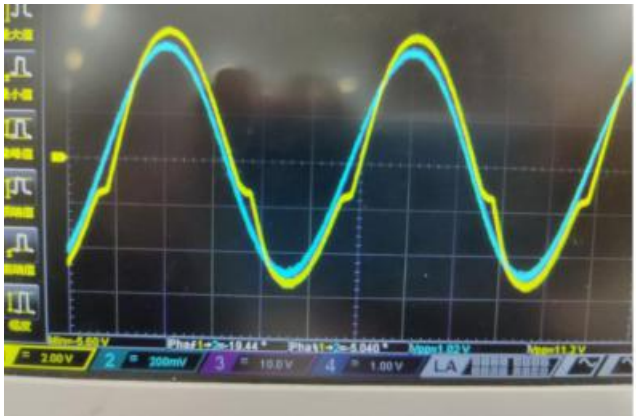


Fig 8



As can be seen from Figure 7, when the input voltage meets the requirements of the problem, the Vpp of the output signal voltage represented by the yellow line is 2V, that is, the gain at this time is 2, and the output amplitude is twice the input amplitude. The phase difference between the two is so small that it can be ignored as zero. When substituted with 10K ω, it can be seen from FIG. 8 that the Vpp of the output signal changes to about 11V, but the phase difference is

still small enough to be ignored. Find the value of resistor R1 with gain 1.
We can use this formula to calculate the theoretical gain, if you want the gain to be equal to 1,R1 over R2 should be equal to 0, so R1 should be equal to 0

Summary

We obtain different operational amplifier circuits by changing the circuit combination and calculate the gain of each circuit. The differences between different operational circuits are compared. In terms of amplitude, the amplitude varies depending on the gain of the circuit, which will be determined by the ratio of resistances. In phase difference, the reverse phase is close to 0°, which is related to the circuit structure.