Analog Project

EE 254

Group 16

Group Members

- **Aditi Luniya - 230002003**
- **Ragini - 230002059**
- **Saiyed faiez - 230002062**
- **Srikanth Ravi Jois - 230002071**

Problem Statement

A 10KΩ load needs to be driven by an amplifier with 14000 gain power at 30 kHz with no phase reversal in its output. Design a suitable amplifier to meet the objectives. Find out its input and output impedances. Draw gain vs frequency response and find out its bandwidth.

Design Approach

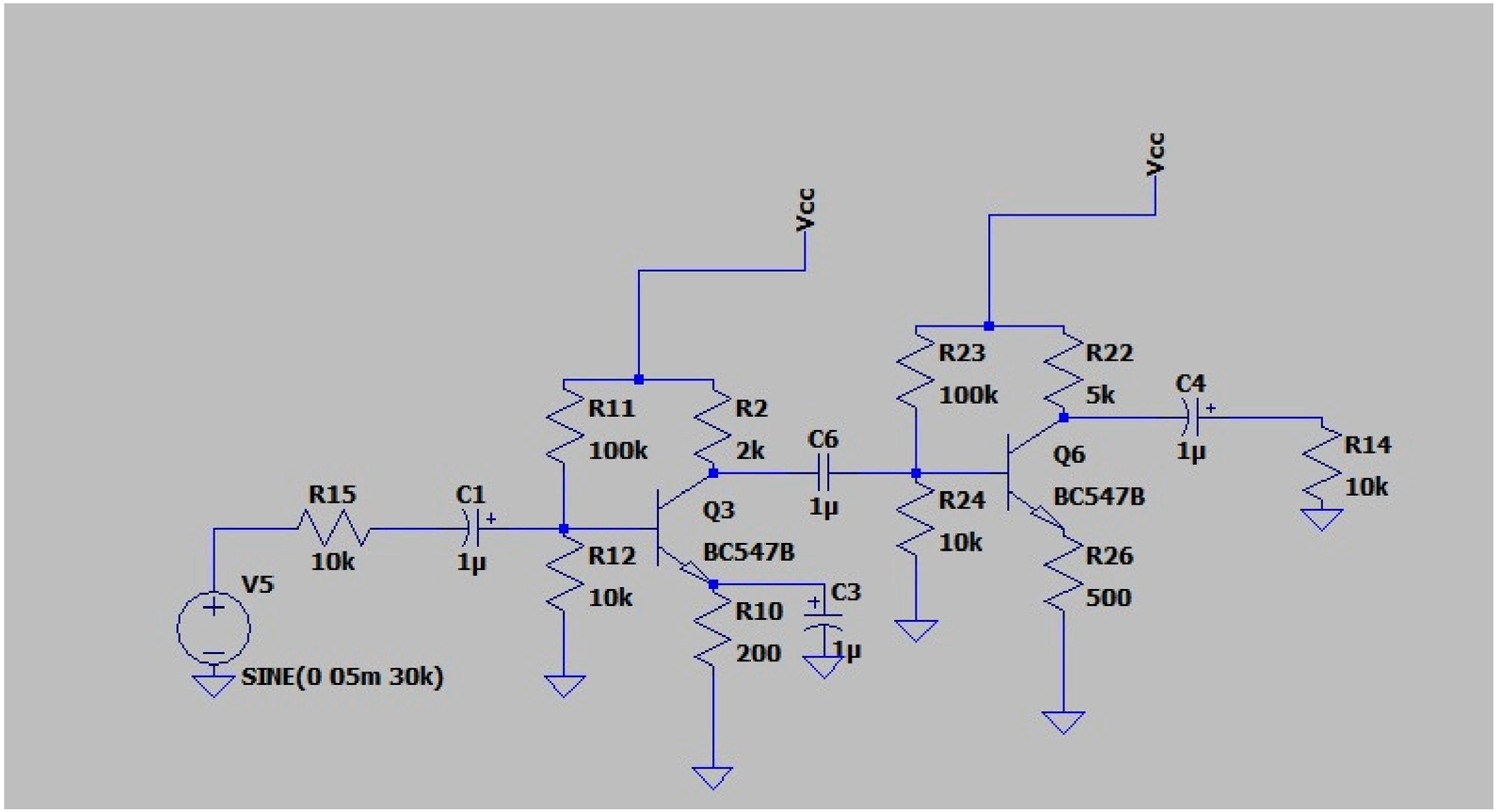
- Initially, we planned on using operational amplifiers to generate the desired gain.
- However, due to the bandwidth restrictions of LM741, we weren’t able to obtain the desired gain.
- Hence we decided to try a single stage transistor based amplifier.
- However, a single stage amplifier couldn’t provide desired gain and stable output.
- So, we decided to opt for a two stage transistor based amplifier.
- We tried to implement our circuit first through simulation in LTSpice using multiple NPN transistors (2N2222A, BC547B, SL100).
- Finally we settled on using transistor BC547B as it provided sufficient gain.

Design Approach

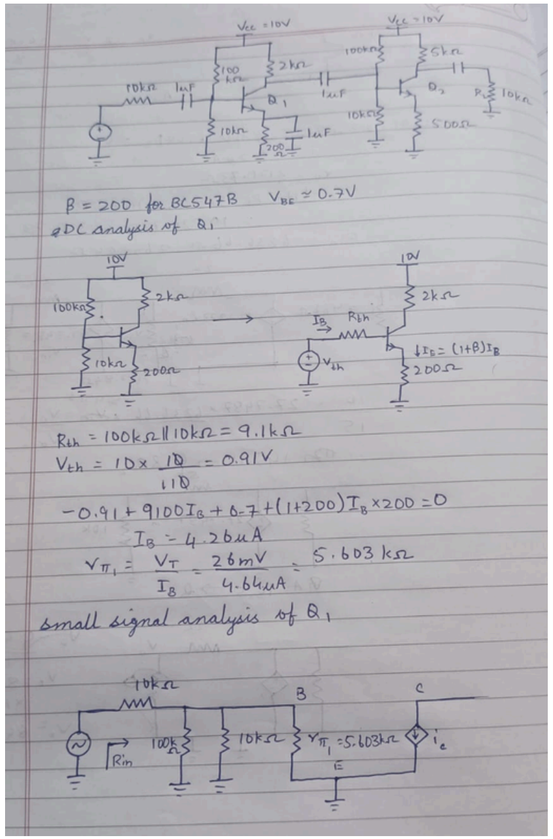
$$PowerGain = \frac{P_{\text{out}}}{P_{\text{in}}} = \frac{V_{\text{out}} \times I_{\text{out}}}{V_{\text{in}} \times I_{\text{in}}}$$

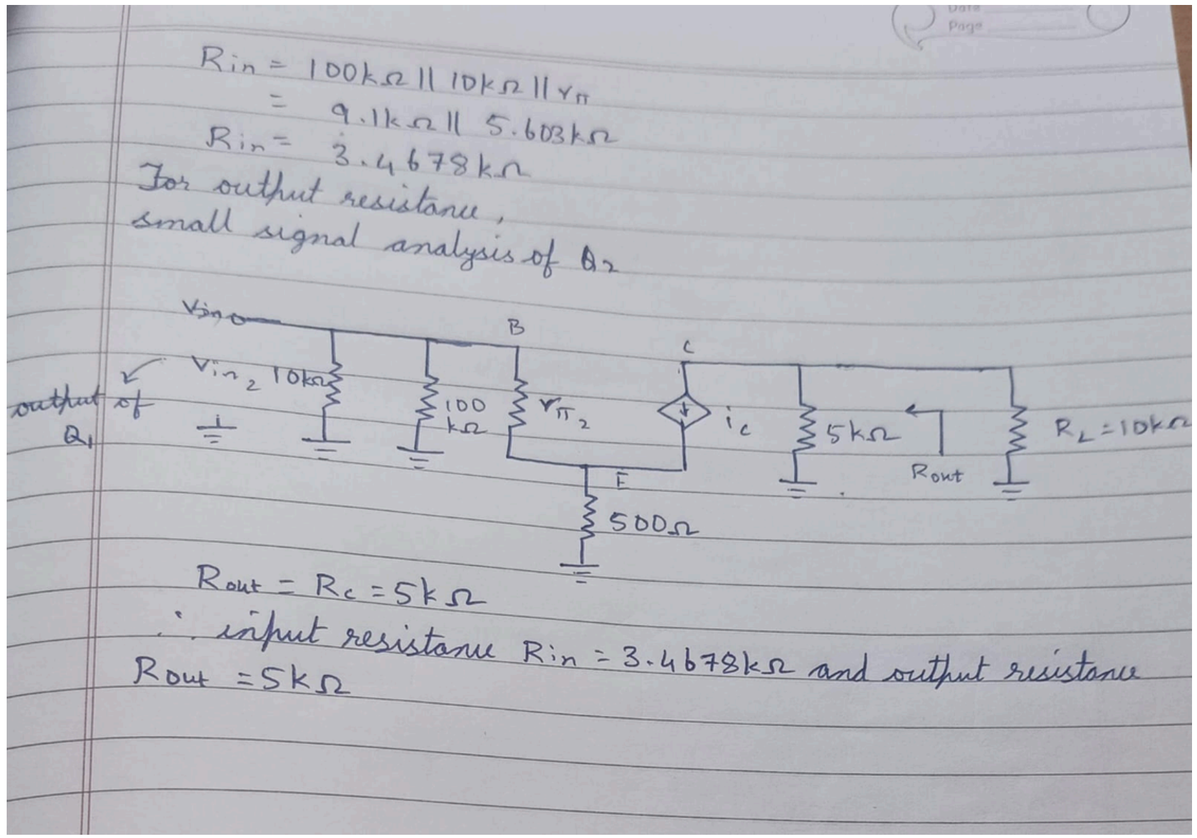
- Using LTSpice, we ensured that the ratio of output power to input power was coming out to be around 14000.

Final Circuit

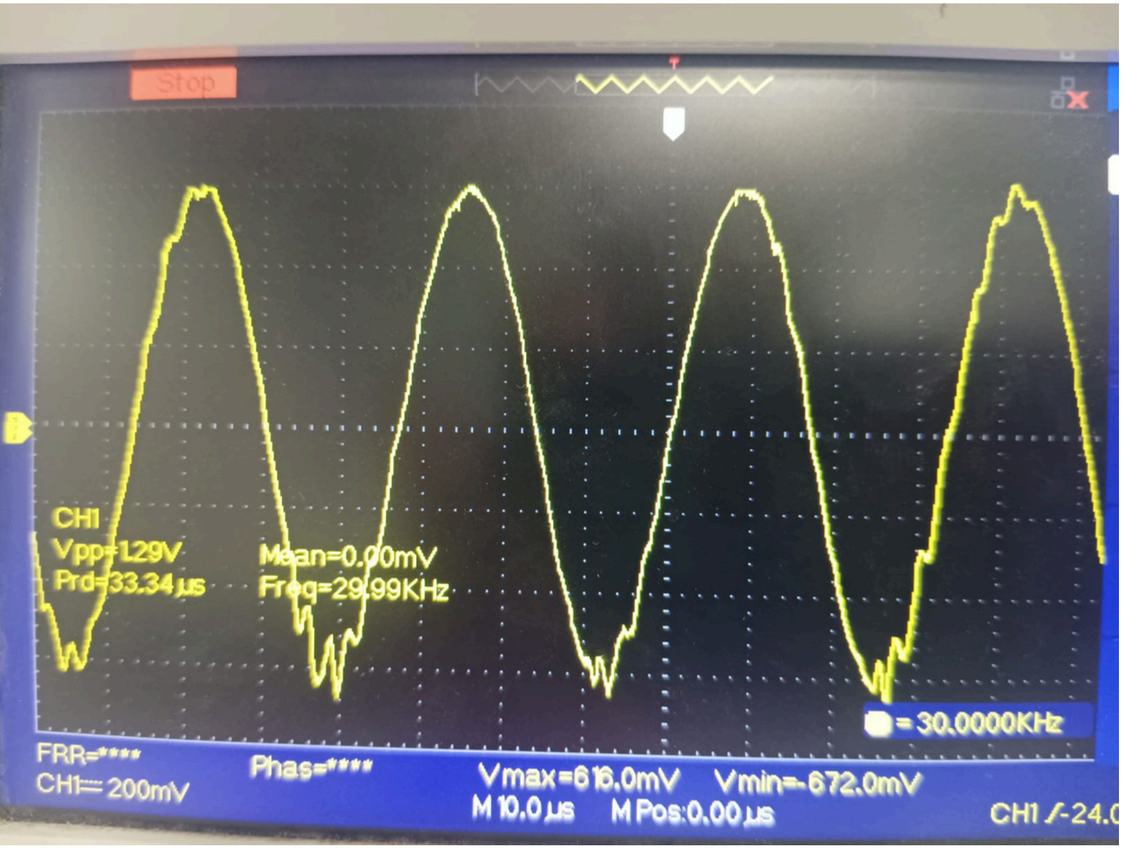


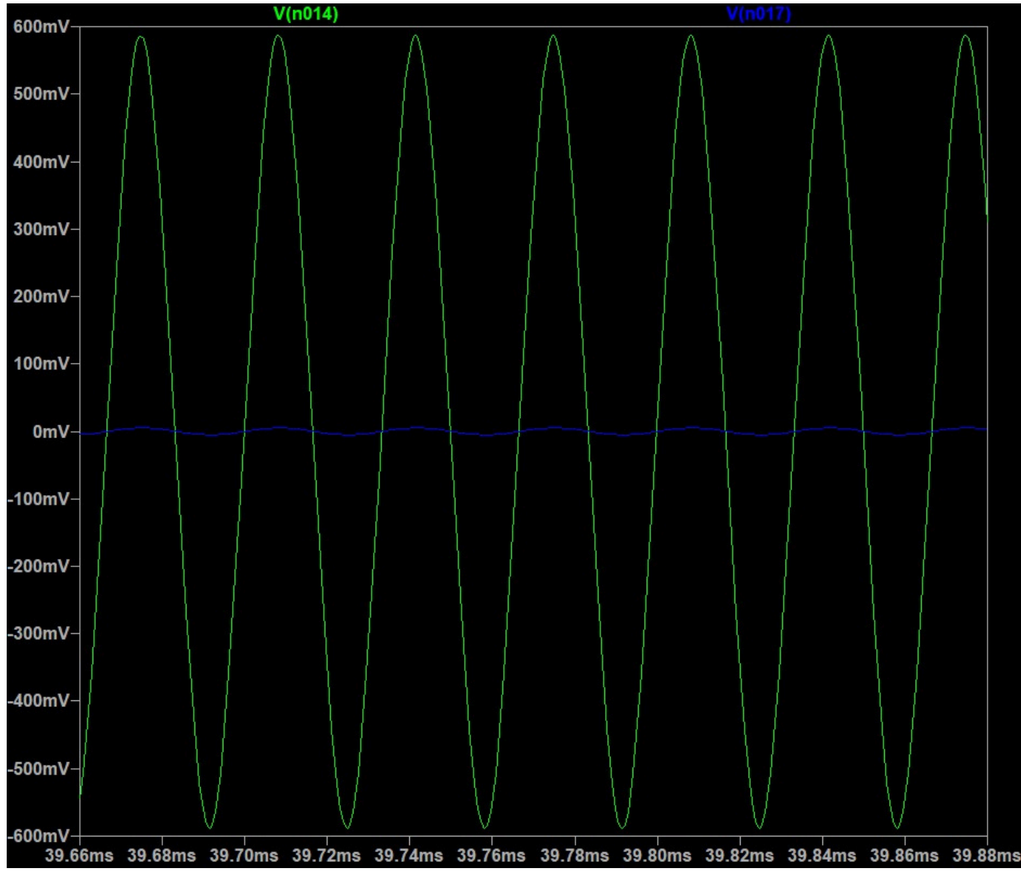
Calculation of Input and Output Resistance



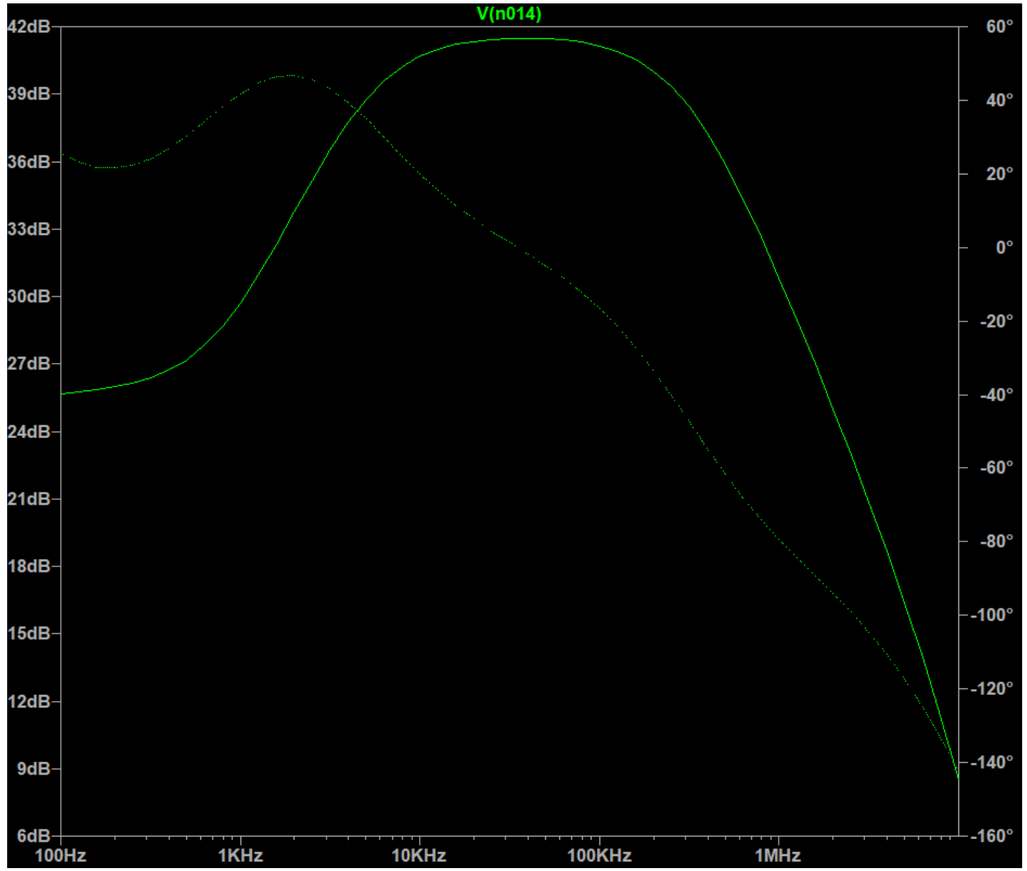


Waveforms


Stop
CH1
Vpp=1.29V
Prd=33.34µs
Mean=0.00mV
Freq=29.99KHz
=30.0000KHz
FRR=****
CH1 200mV
Phas=****
Vmax=616.0mV
Vmin=-672.0mV
M 10.0µs
M Pos:0.00µs


V(n014)
V(n017)
600mV
500mV
400mV
300mV
200mV
100mV
0mV
-100mV
-200mV
-300mV
-400mV
-500mV
-600mV
39.66ms
39.68ms
39.70ms
39.72ms
39.74ms
39.76ms
39.78ms
39.80ms
39.82ms
39.84ms
39.86ms
39.88ms

Gain vs Frequency Plot



Bandwidth = 317.866 KHz

THANK YOU!