Electronic Workshop -2
Project-1

THE AUDIO AMPLIFIER

Mohit pavan kumar-2018102016
Vamshi kashyap-2018102042
Group-21

18th february 2020

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1. ACKNOWLEDGEMENT AND ABSTRACT

1.1 ACKNOWLEDGEMENT

Firstly we want to express our gratitude to professors **Zia abbas** and **Madhav krishna** for their encouragement

Secondly we would like to extend our thanks to the TA's **Sushanth Reddy,Vashisht madiraju,Rahul Sajnani,Balaji,Animesh Sahu,Salay jain** for their great support towards the circuit and project

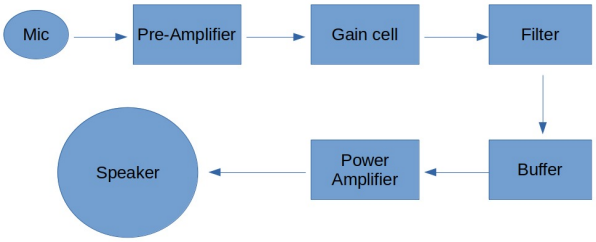
Next we would like to extend our thanks to **vivek sir,purnavati mam** who are always helpful with working of oscillioscopes and all devices

1.2 ABSTRACT

Audio amplifier is generally used to amplify the low power audio-signals into signals which can drive a speaker.In this project we have the good outut results for the whole project which have driven to 1.5Watt power approx,which is operated between 20Hz and 20kHz.

It has 4-parts

1. pre-amp
2. gain cell
3. Band-pass
4. power-amp



2. INTRODUCTION AND OBJECTIVES

2.1 INTODUCTION

The audio power amplifier is generally used to amplify the low power audio signals ,so it have many applications in mp4-players,laptops,mobile phones,etc..

This amplifier has a gain of 500 and works at approximately 20mvpp and it works in the band of 20Hz and 20KHz which audible range of a human being and can drive a 1.5W speaker

Amplifiers are classified in two main ways: The first classification is by function and other is by frequency response,frequency response corresponds to the band of frequencies at which the amplifier is operated .

2.2 OBJECTIVES

The main objective of this project is to amplify the low power signals to high power to drive the speaker

The other objectives are

- Cancellation of Noise
- passing the band of frequencies
- increasing the current driven by low power signal

3. IMPLEMENTATION

The 4-stages of the audio amplifier are as follows

3.1 PRE-AMP

This stages uses the differential amplifier to cancel the noise and amplify the signal of 20mVpp to 400mVpp which is gain of 20

COMPONENTS USED:

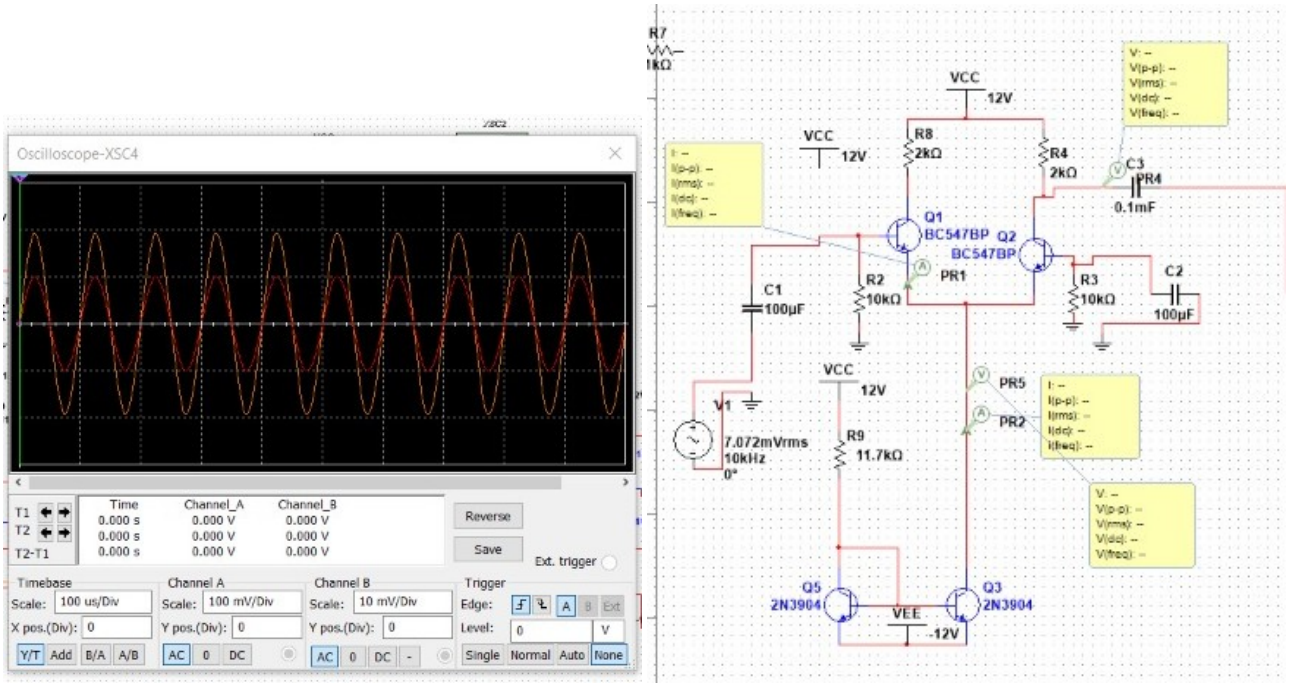
- Rc=2k
- current mirrot(wildar) with Re=11.3K
- 2-BC547-npn transistors
- 1 capacitor

Rc ,amplifiers are used for gain and current mirror for constant withdrawl of current. The transistors are kept in the differential mode so that the input is given as Vd/2,-Vd/2 for both the transistors so that the noise going into both the transistors is same,and it is removed because we are taking the difference of outputs, the cap is used for dc block of the output

GAIN CAN BE CALCULATED BY :

$\mathrm{I}_C \cdot R_C/V_T$

from this equation we calculated the $\mathrm{R}_C = 2K, R_e = 11.3K$



3.2 GAIN-CELL

This stage generally uses the common emitter circuit because of its high input impedence,and have a gain of 50 which amplifies signal to 10Vpp

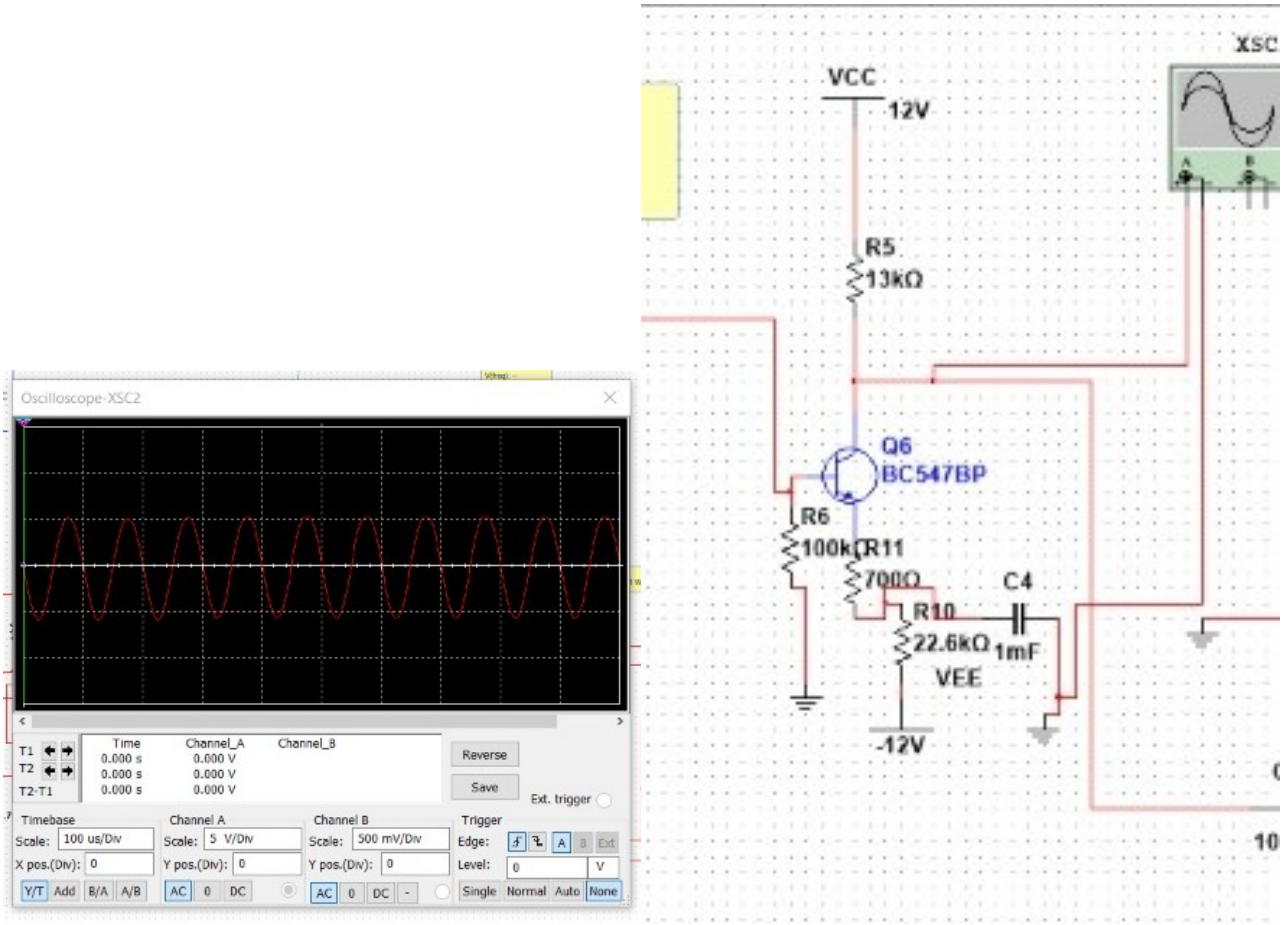
COMPONENTS USED:

- resistors-13k,700ohms,100ohms
- 2-capacitors(22nF)(for dc-block of input and output)
- 1-BC547 npn transistor

Gain here can be calculated by

R_L/R_e

from this we got $R_C = 13k, R_e = 700ohm$



3.3 BAND-PASS

This uses a active band-pass using an op-amp having Hign-pass at 1st stage and Low-pass at its 2nd stage which are isolated by the op-amp of its infinite resistance

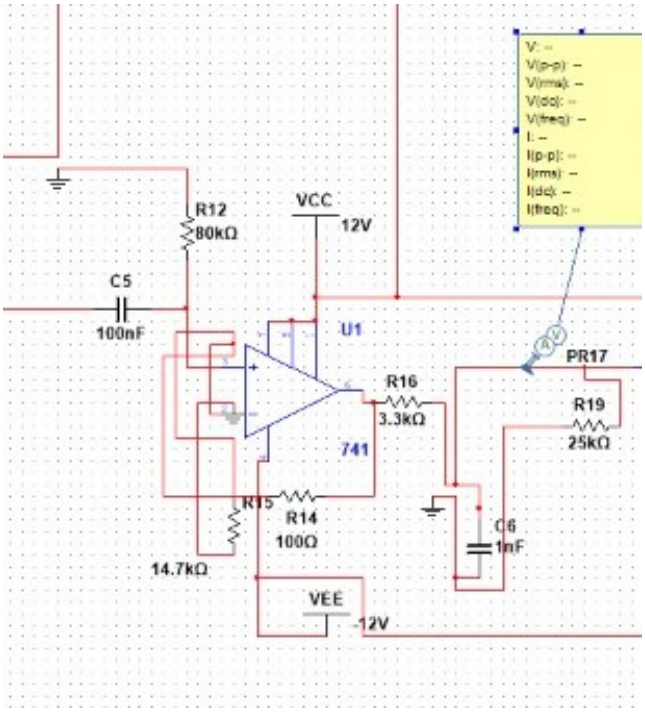
COMPONENTS REQUIRED

- op-amp(471 IC)
- resistors 80K,100ohm,14.7K,3.3K
- capaciotrs 1nF,100nF

Here the band frequencies can be calculated by

f=1/2*pi*R*C

so the resistances at high pass and low pass got to be 80K,3.3K,with capacitors 1nF,100nF to get the band from 20Hzto 20KHz approximately.



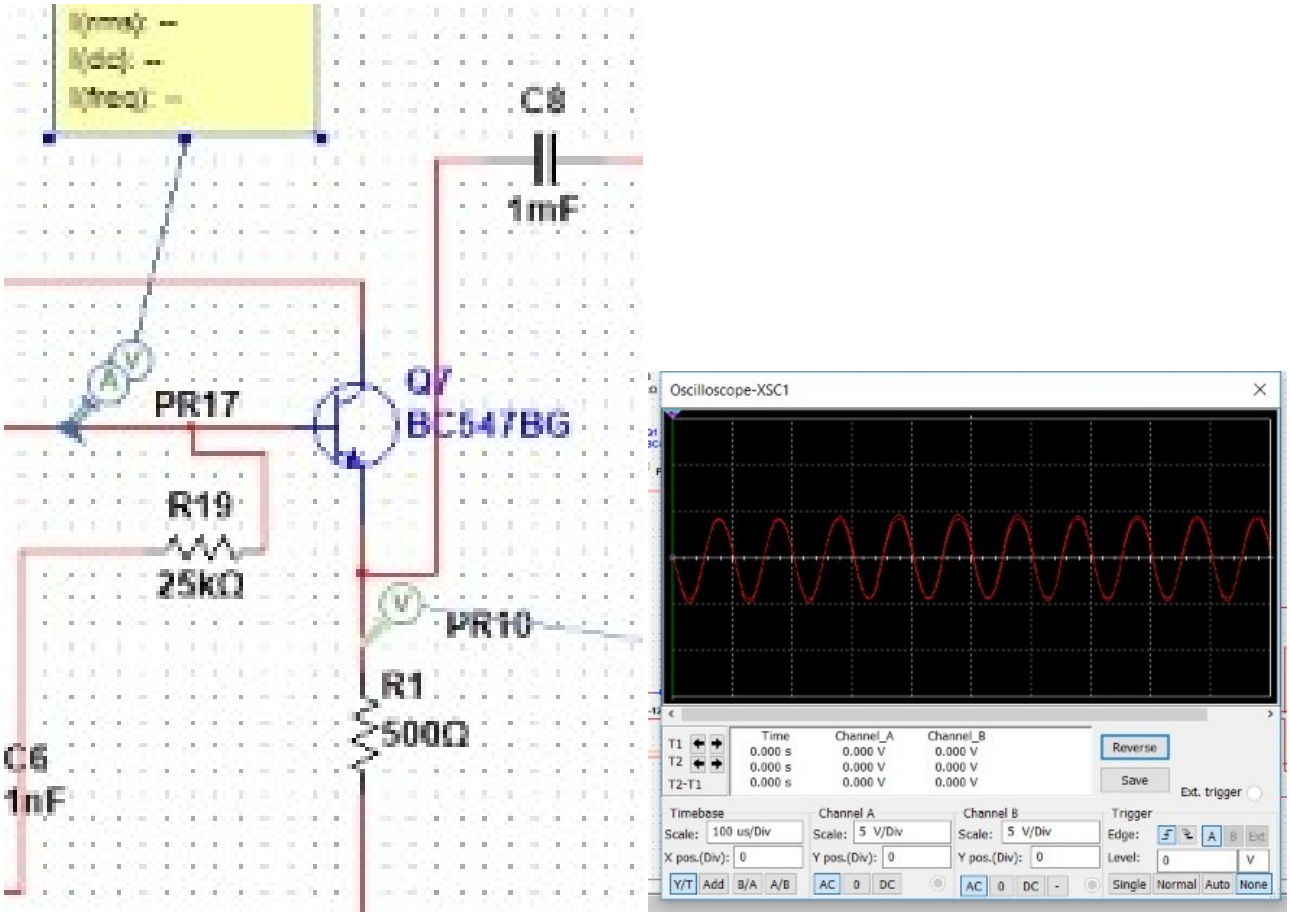
Here our circuit got 5Vpp at 35KHz which is comparably efficient.

3.4 BUFFER

This stage is just used for impedence matching as of its infinite resistance

COMPONENTS REQUIRED

- 1transistor BC547
- 1 resistance 500ohm

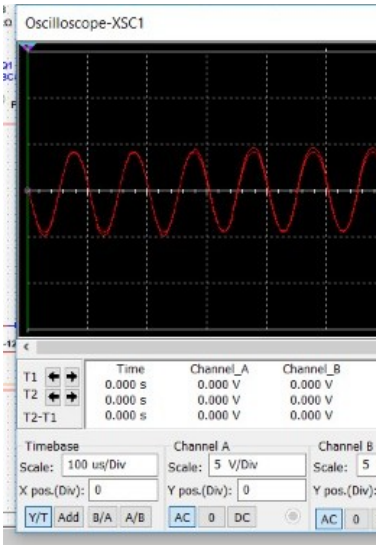


3.5 POWER-AMP

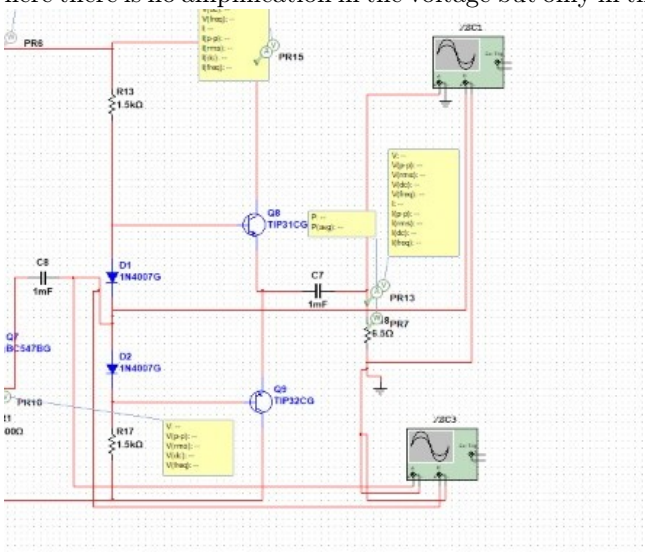
This stage uses the diode biasing configuration of AB-class power amplifier
Here the current is amplified to 340vrms to load the resistance of 10ohm so that the average power produced is 1.5W

COMPONENTS REQUIRED

- transistors-Tip31(npn),Tip32(pnp)
- 2 diodes(1N4007)
- 2 resistors 1.5Kohm
- 10ohm resistance(with heat sink)

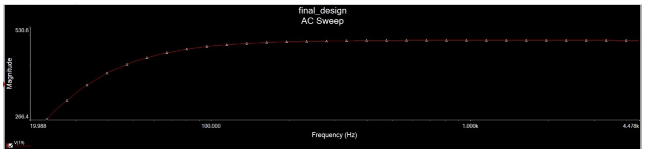


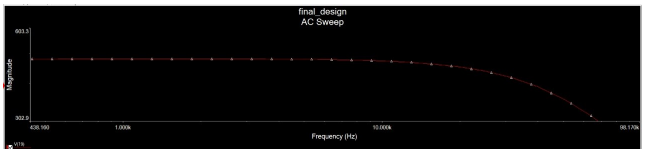
here there is no amplification in the voltage but only in the current to drive the speakerof 1.5W.



4. RESULTS

- input voltage=20mVpp
- output at diff-amp=400mvpp
- gain at diff-amp=20
- output at gain-cell=10Vpp
- gain at gain-cell=50
- band at band-pass=20Hz and 20KHz
- no gain at band-pass
- gain at power amp for current=346vrms
- power output at power amp=1.5W
- speaker resistance=7ohm approx





5. CONCLUSIONS

The audio power amplifier is designed in four stages: pre-amplification unit, gain cell unit, active filter unit and power amplification unit. For the pre-amplification unit, BC547, NPN transistor is used to achieve the gain; gain cell is designed to to get a voltage gain; active filter is designed to achieve amplification for band of voices only; for the power amplifier unit, TIP31 and TIP32 transistors are used. In addition, the measured results show the output power is 1.5W, 350-400mA current and voltage of around 3.5Vrms at output. Judging from all kinds of results, this designed audio power amplifier can meet the aim of the project topic.

6. REFERENCES

For theory:

- Tutorials -nptel videos at youtube
- for electronics-https://www.learnabout-electronics.org/
- https://www.electronics-tutorials.ws/
- CAD-credits - multisim