**BIRZEIT UNIVERSITY**

Faculty of Engineering and Technology

Electrical and Computer Engineering Department

Simulation Lab (ENEE4104)

# Negative feedback, Modular design and sub-circuits using ORCAD

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Sec#: 1

# 1. Abstract:

The aims of this prelab is to learn concept of modular design used ORCAD, to find the gain, input impedance, output impedance and bandwidth of close loop and open loop multistage amplifiers.

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# List of Figures:

# 1. The Open-Loop Multistage amplifier with R=10K:
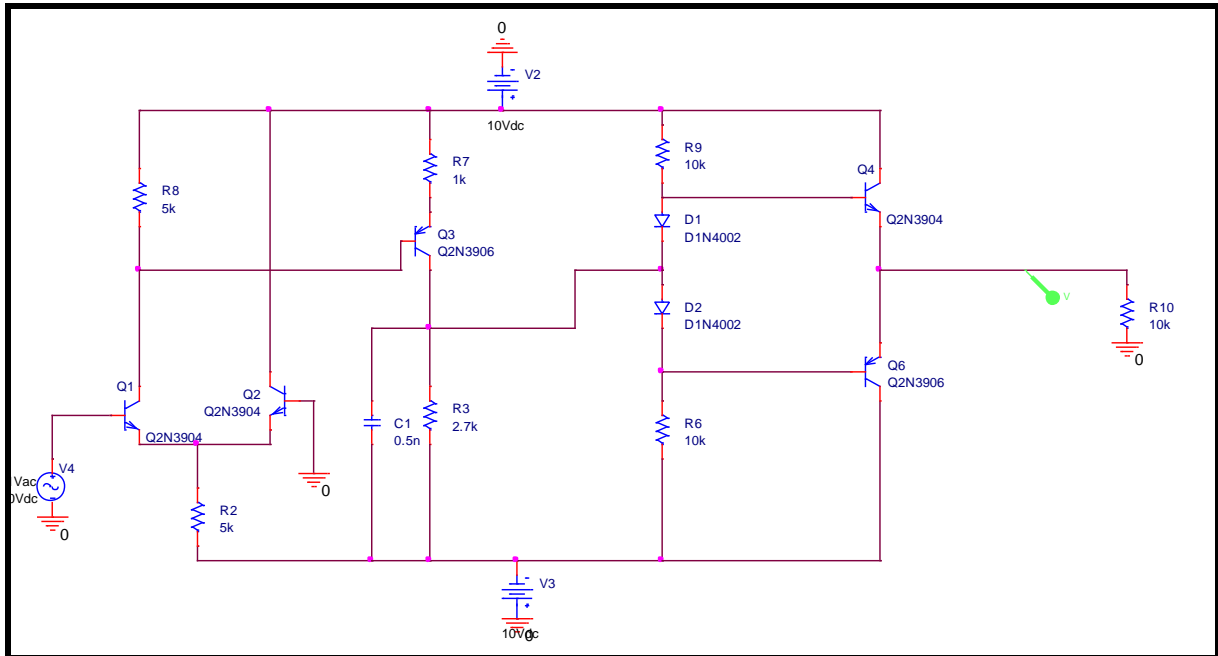
The Circuit:



**Figure 1: The Open-Loop Multistage Amplifier**

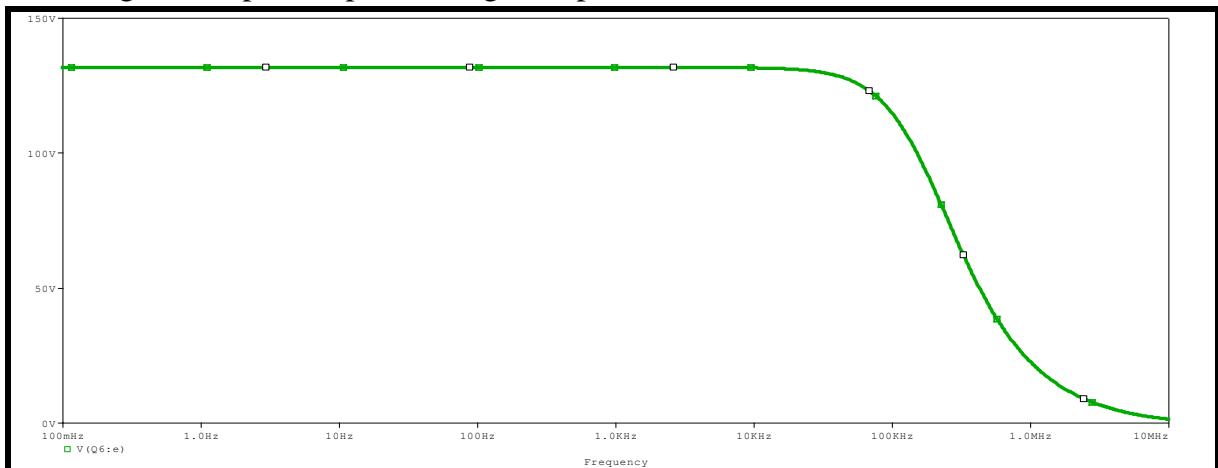## 1.1 The gain of open loop multistage Amplifier:



**Figure 2: The Gain of Open loop multistage amplifier at R=10KΩ**

**From the Figure 2: the gain is almost 131.6.**

## 1.2 The Input Impedance:
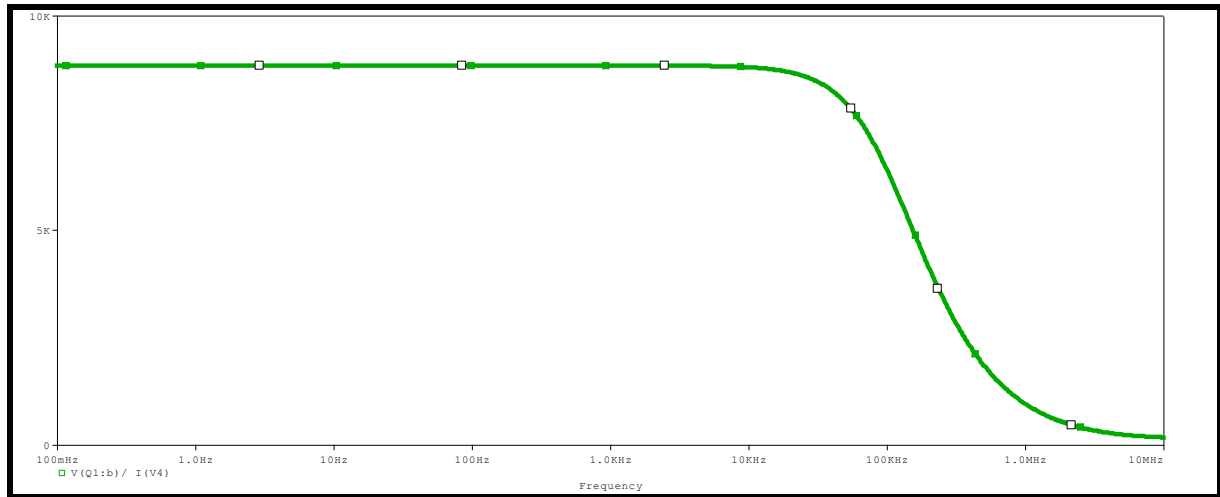
$$Zin=\frac{Vin}{Iin}$$



**Figure 3: The Input Impedance of open loop multistage amplifier at R=10KΩ**

**From figure 3 note that the value of input impedance = 8.83KΩ**

## 1.3 Output impedance:

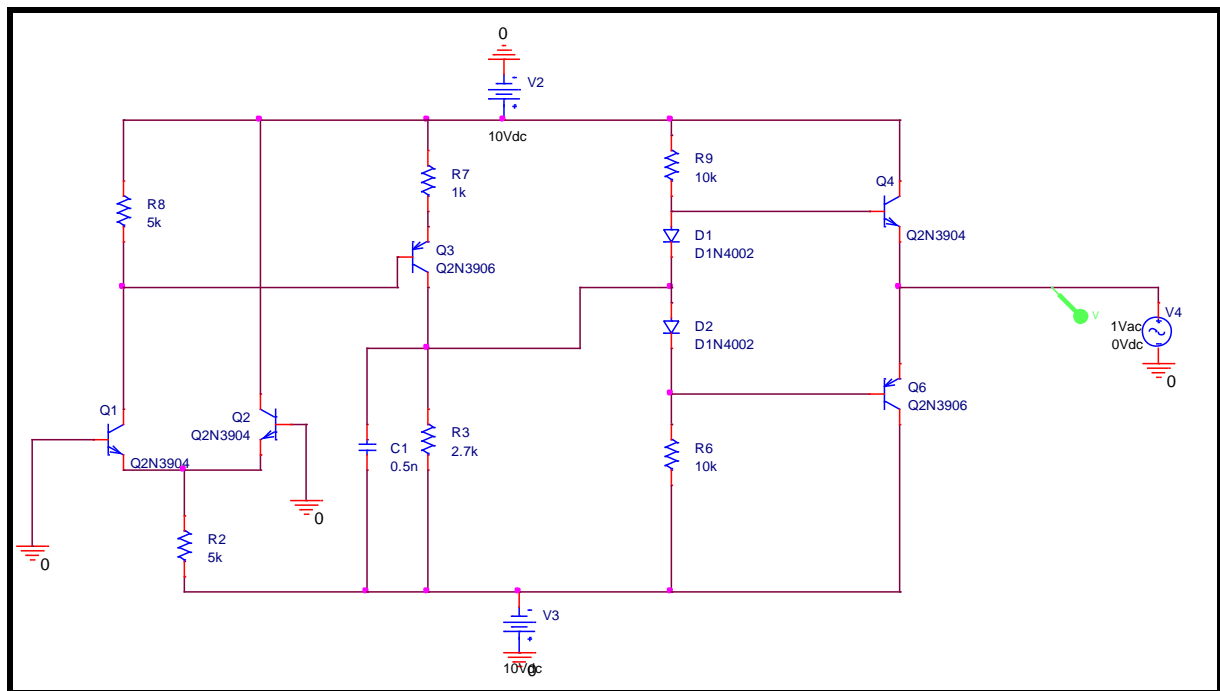To find the output impedance the Circuit shown in the Figure 4 was plotted:



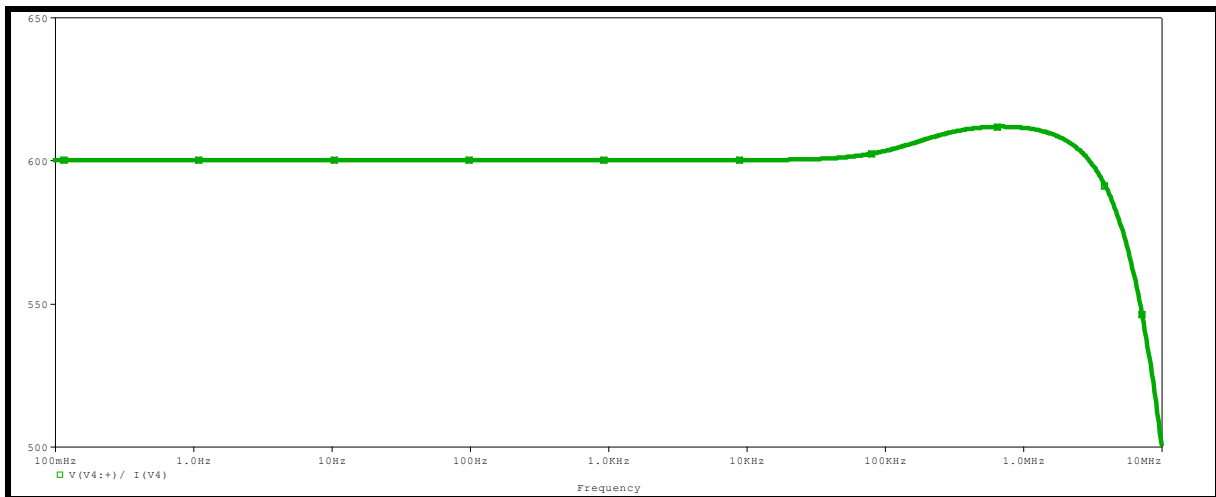**Figure 4: the circuit used to find the Zout**

The Zout:



**Figure 5: The output impedance**

**From the Figure 5: the output impedance is 600**

## 1.4 The bandwidth:

$$B.W = \frac{1}{\sqrt{2}} * Gain = 0.707 * 131.7 = 93.1$$
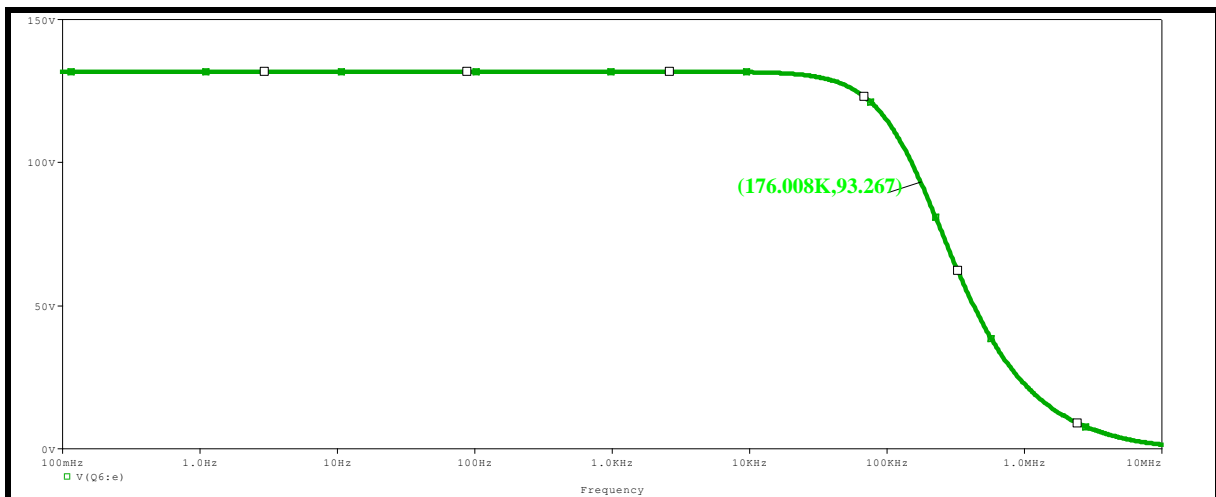


**Figure 6: The B.W of open loop multistage amplifier at R=10KΩ**

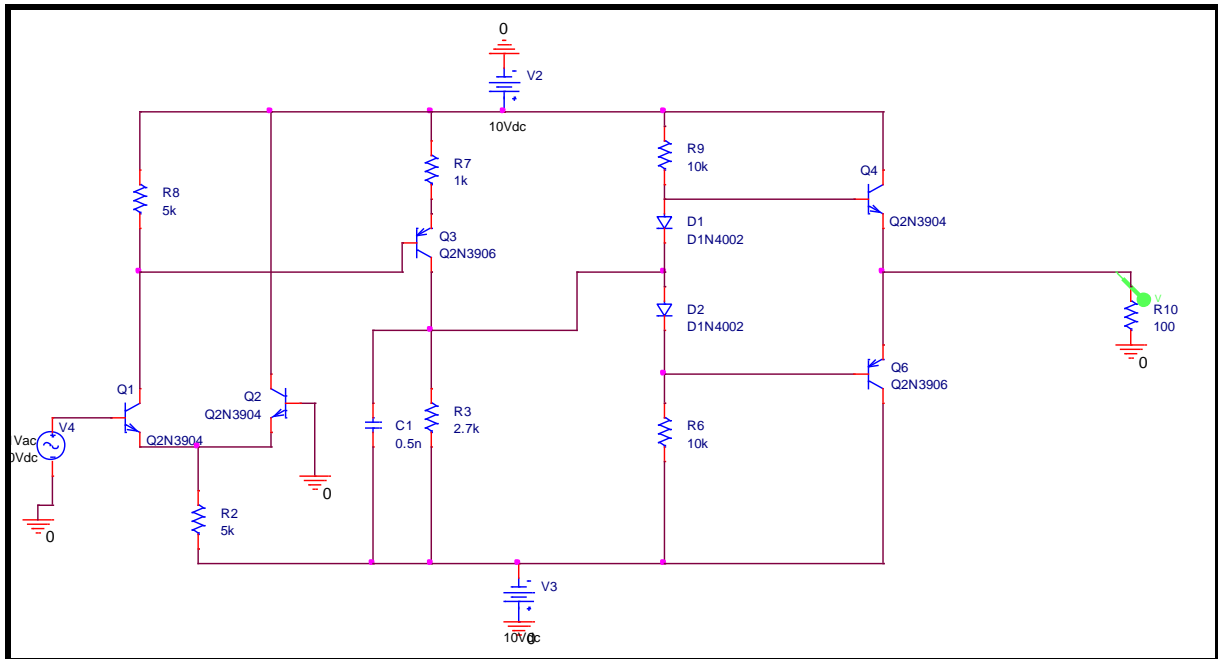## 2. The Open-Loop multistage amplifier with R=100 Ω



**Figure 7: open loop multistage amplifier at r=100 Ω**
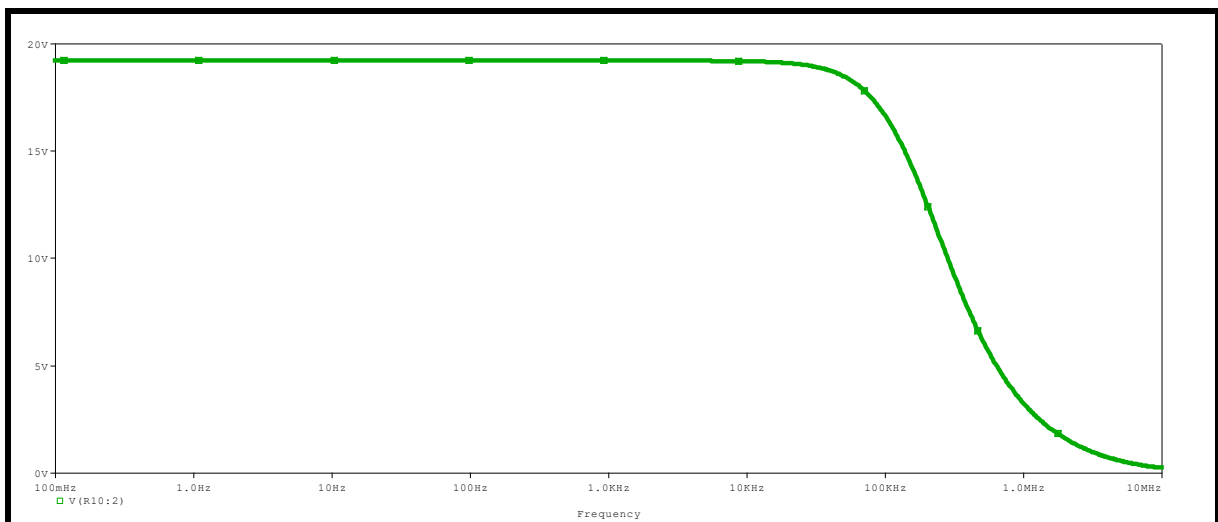
## 2.1 The Gain:



**Figure 8: the gain of open loop multistage amplifier at R=100 Ω**

## 2.2 The B.W:

$$\frac{1}{\sqrt{2}} * Gain = 0.707 * 19.198 = 13.572$$
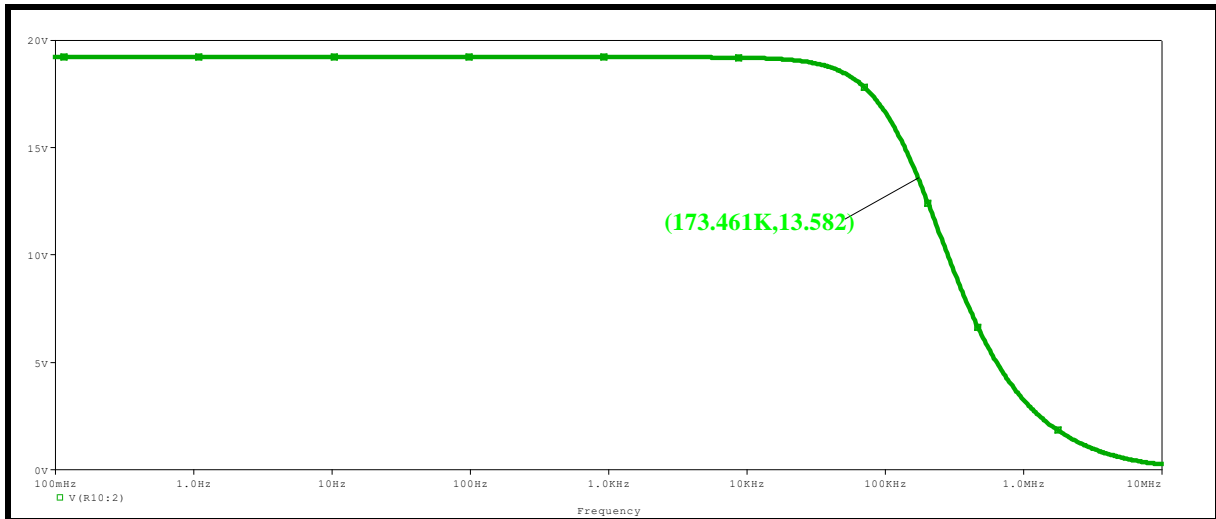


**Figure 9: The gain of open loop multistage amplifier at R=100Ω**
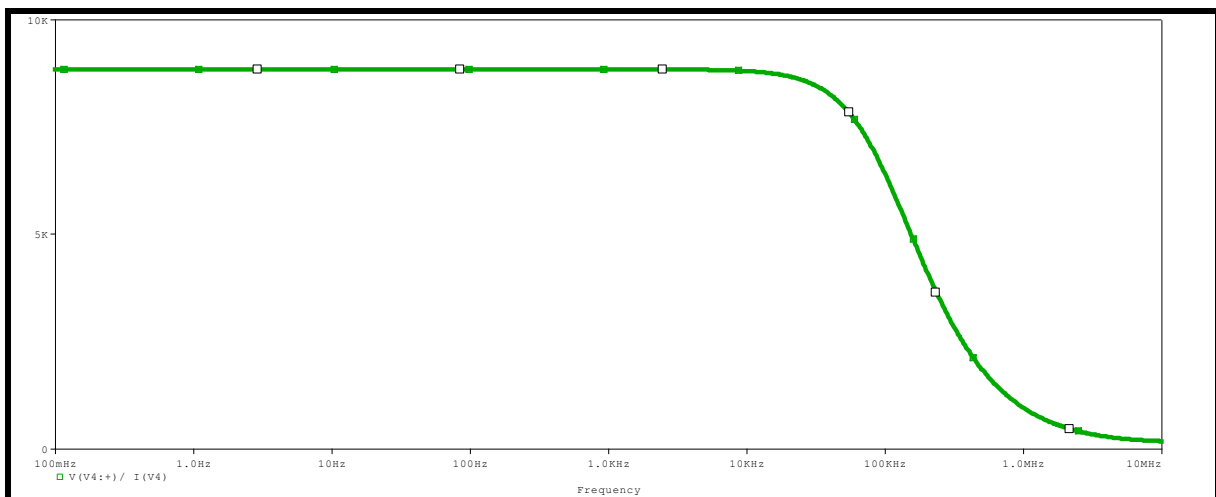
## 2.3The input impedance:



**Figure 10: The input impedance of open loop multistage amplifier at R=100 Ω**

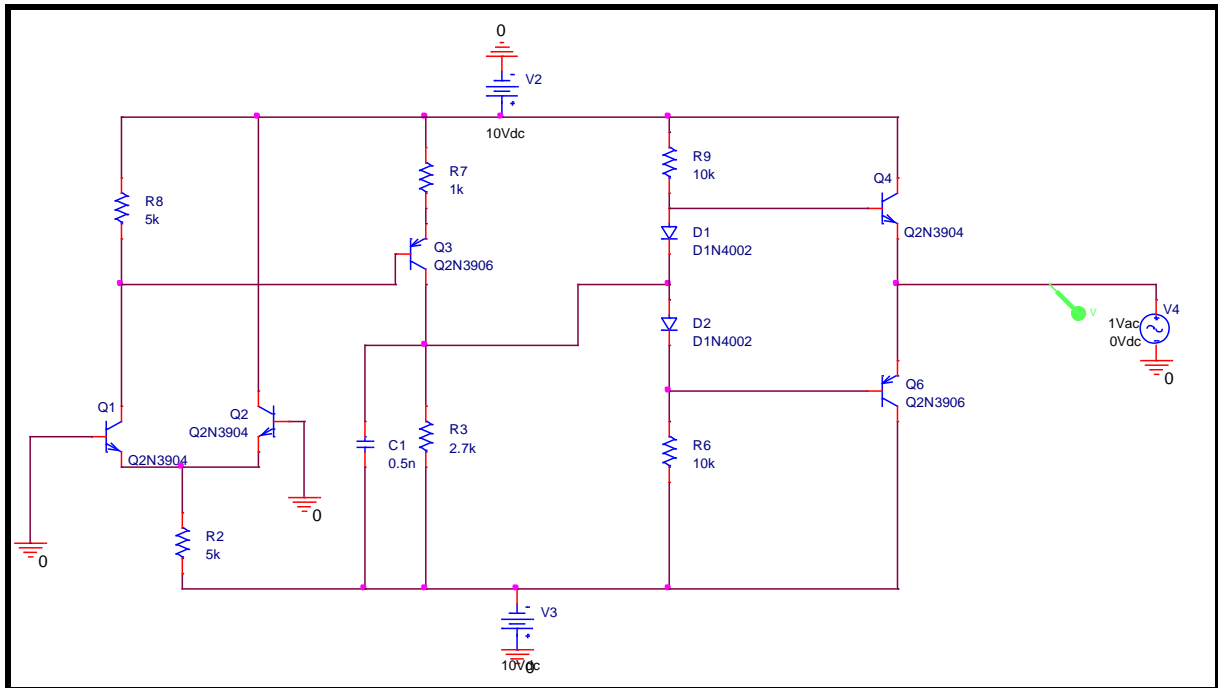From figure 10, the input impedance is 8.8K

## 2.4 Output impedance:



**Figure 11: the circuit used to find Zout**
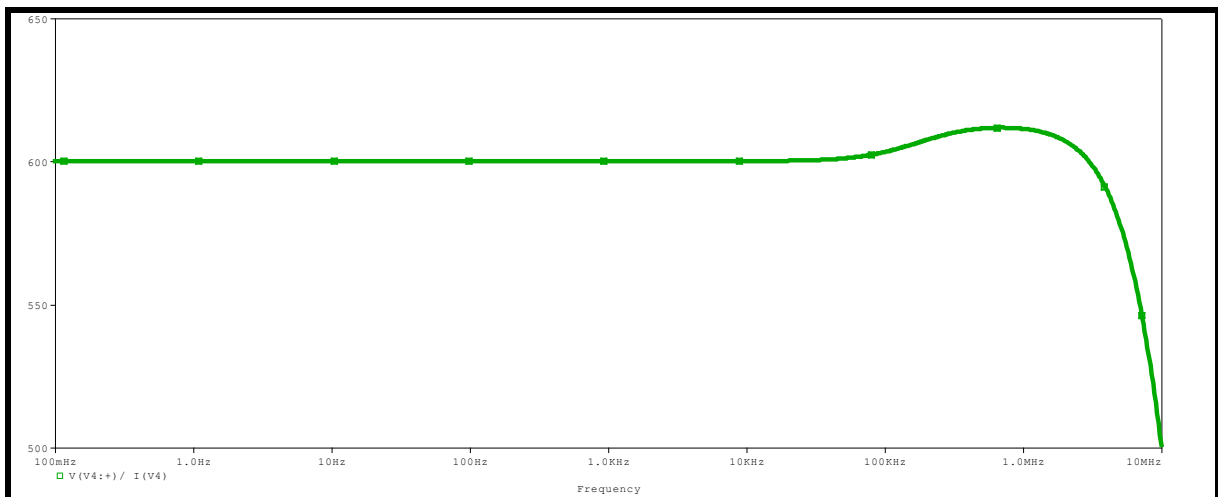
The output impedance:



**Figure 12: The output impedance of multistage amplifier at R=100 Ω**
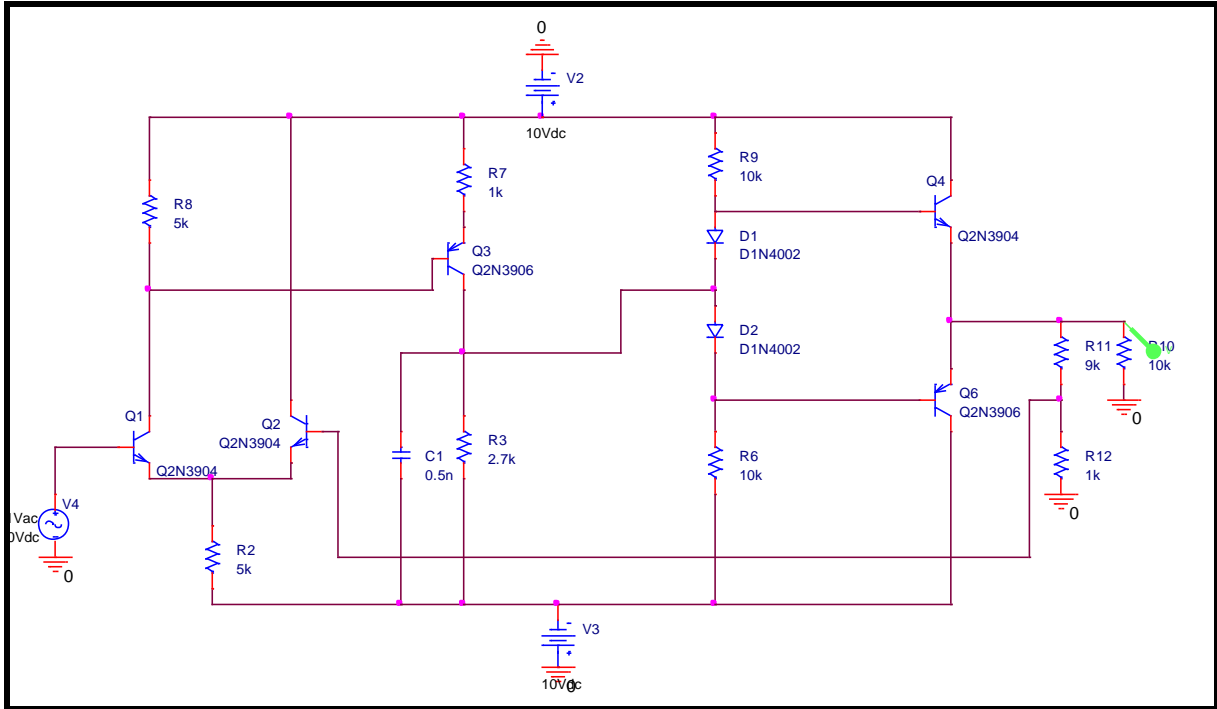
# 3. The closed loop multistage amplifier at R=10K:



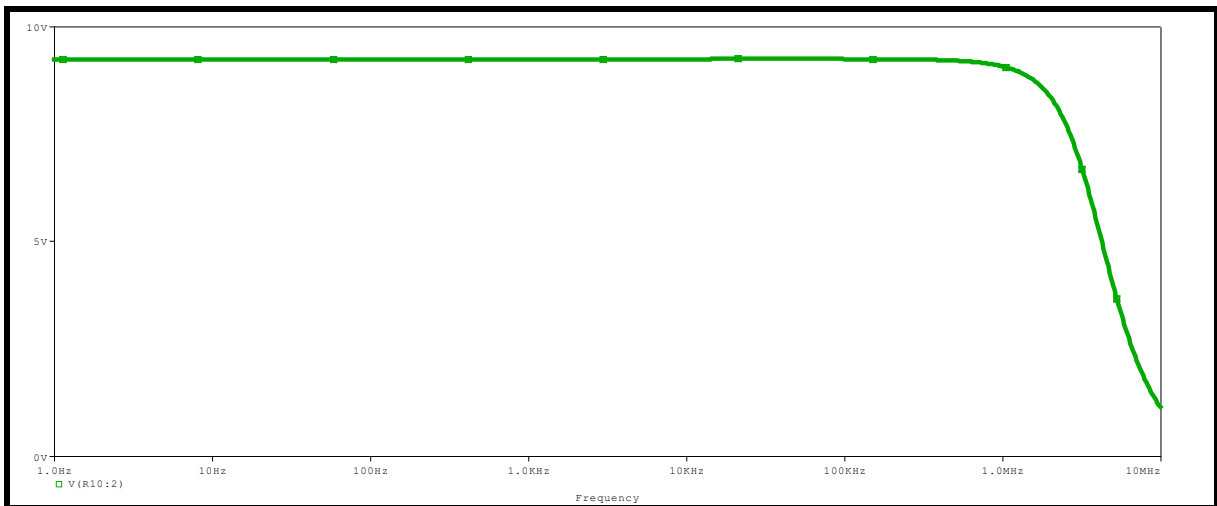**Figure 13: close loop multistage amplifier at R=10K**

## 3.1 The Gain:



**Figure 14:The gain of close loop multistage amplifier at R=10K**

From the Figure 14, the gain almost 9.

## 3.2 The B.W:

$$\text{B.W} = \frac{1}{\sqrt{2}} * Gain = 0.707 * 9.2 = 6.5044$$
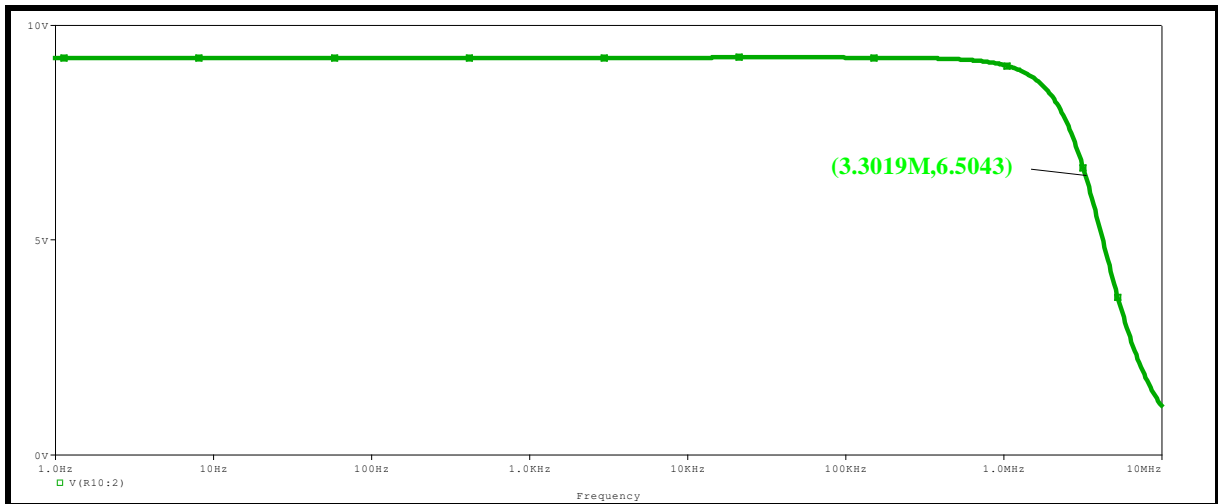


**Figure 15: The B.W of close loop multistage amplifier at R=10K**
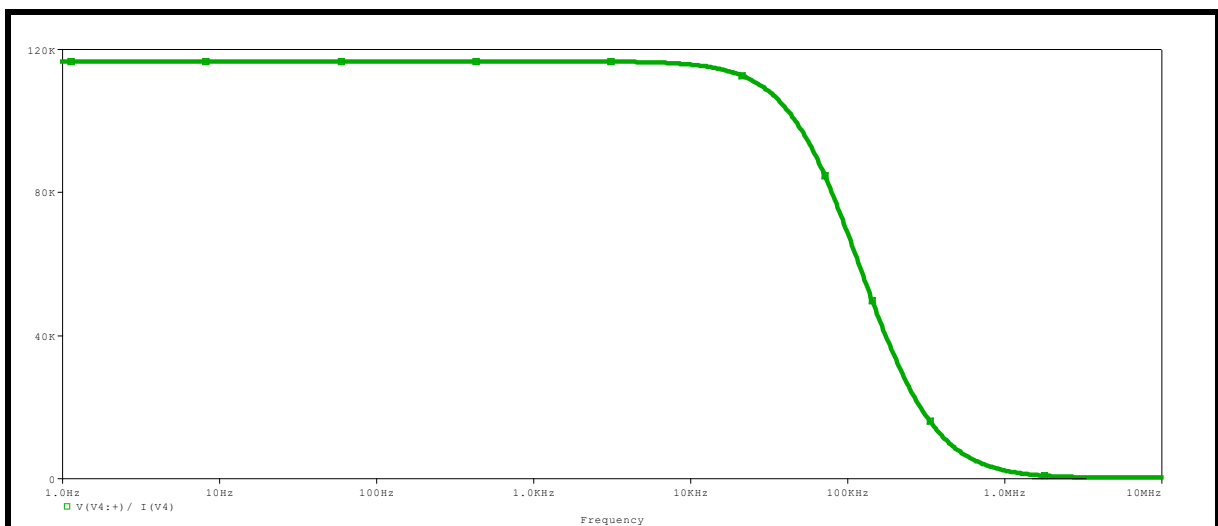
## 3.3 The input impedance:



**Figure 16: Zin of closed loop multistage Amplifier at R=10K**

From the Figure 16, the input impedance 116.5 K
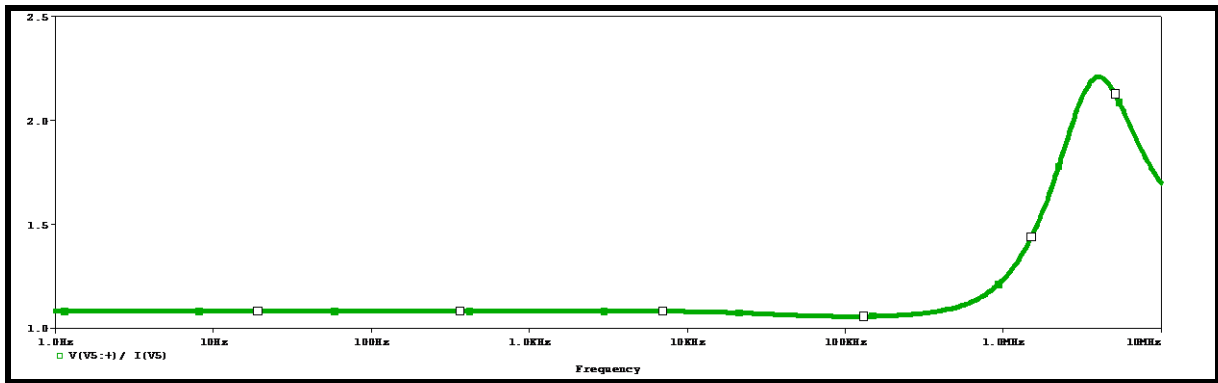
## 3.4 The output impedance



**Figure 17: Zout of close loop multistage amplifier**

From the Figure 17, the output impedance 2.2K

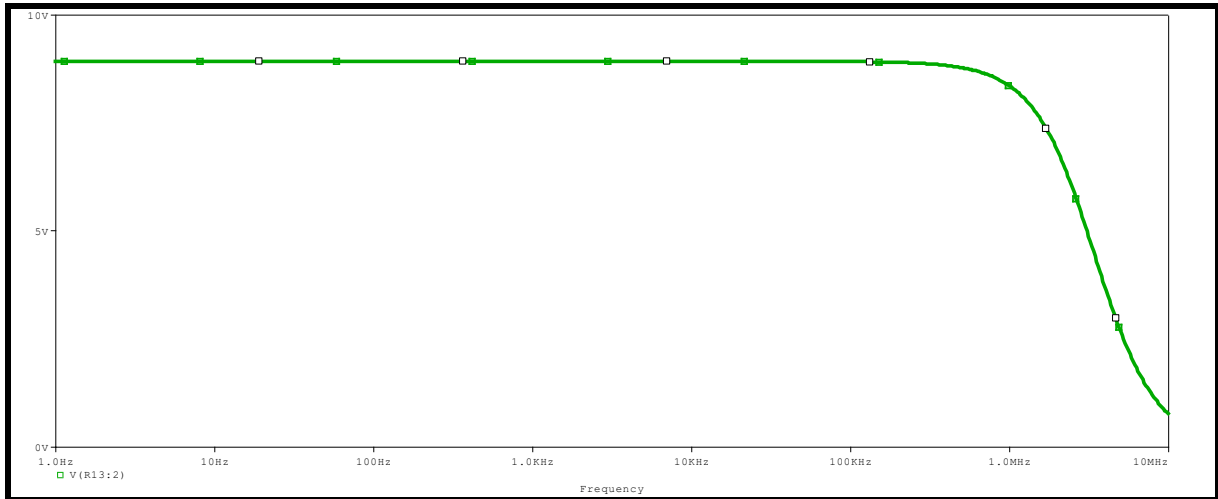# 4. The closed loop multistage amplifier at R=100:

## 4.1The gain



**Figure 18: The gain of clos loop multistage amplifier at R=100 Ω**

From the Figure 18, the gain of close loop multistage Amplifier at R=100 is 8.9

## 4.2 The B.W:
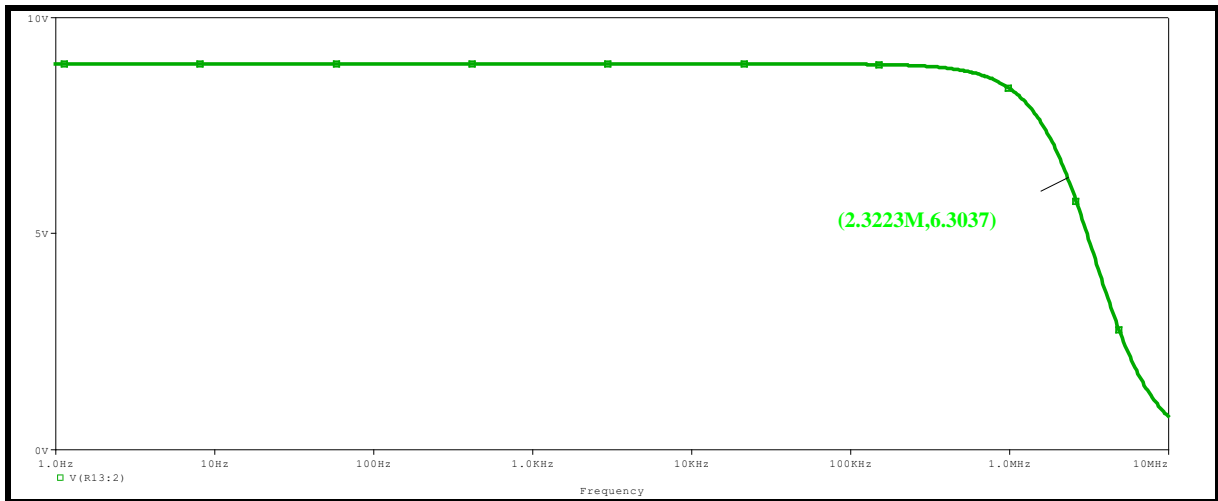
B.W = $\frac{1}{\sqrt{2}} * Gain$ = 0.707 *8.9= 6.2923



**Figure 19: The B.W of close loop multistage amplifier at R=100**
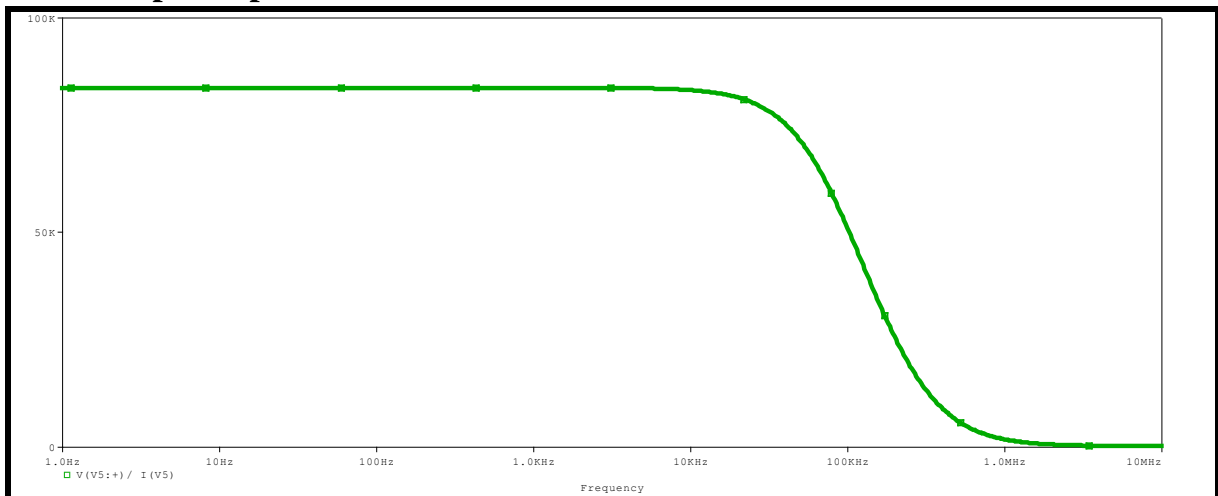
## 4.3 The input impedance



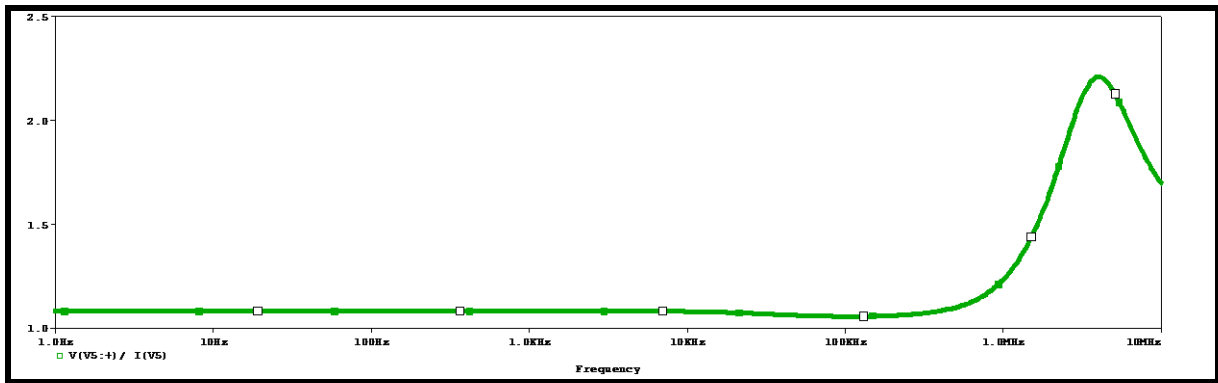**Figure 20: The input impedance of close loop multistage amplifier at R=100 Ω**

## 4.4 The output impedance:



**Figure 21: Zout of multistage amplifier**