EE230: Experiment 2
Non-idealities in Op-amps

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1 Overview of the experiment

1.1 Aim of the experiment

In your own words, describe the aim of the experiment. In this experiment we try to find the non idealities of an Op-amps ie the offset voltage, I_{b-} and I_{b+}.
We also aim to find the open loop gain of a Op-amp

1.2 Methods

Op-amp is widely used in many circuits. its non idealities hence plays important role.Offset voltage causes a DC shift in the output if the gain is sufficiently high.-I_{b-} and I_{b+}. Can cause a DC shift in the output, depending on the circuit components. As he offset voltage and -I_{b-} and I_{b+}. are very small so we use the amplifing property of the opamp, to amplify the irregularities and then measure them

2 Design of Op-amp 741

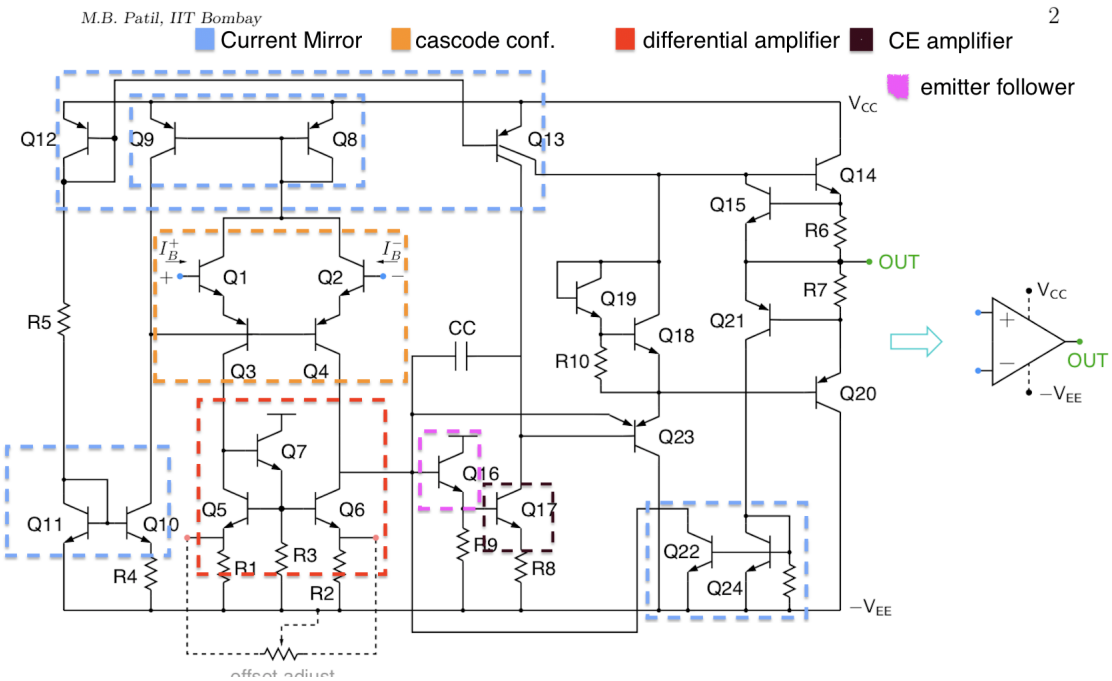
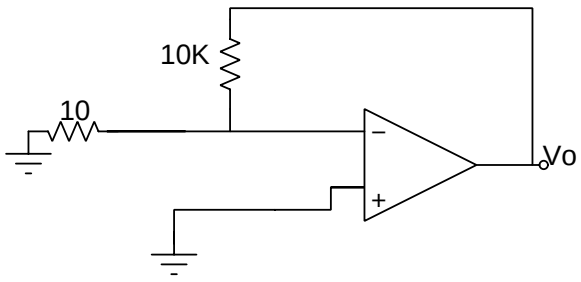


figure :lab manual

3 Experimental results

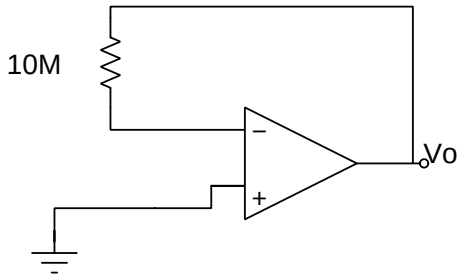
3.1 Input offset voltage measurement



for measuring voltage offset

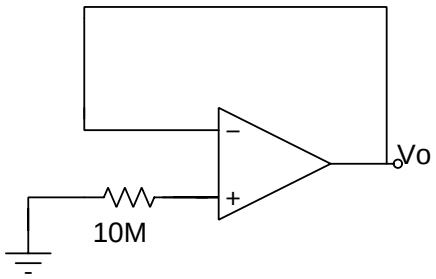
$Vo = +0.715V$

$Vos = +0.715mV$



for measuring ib-

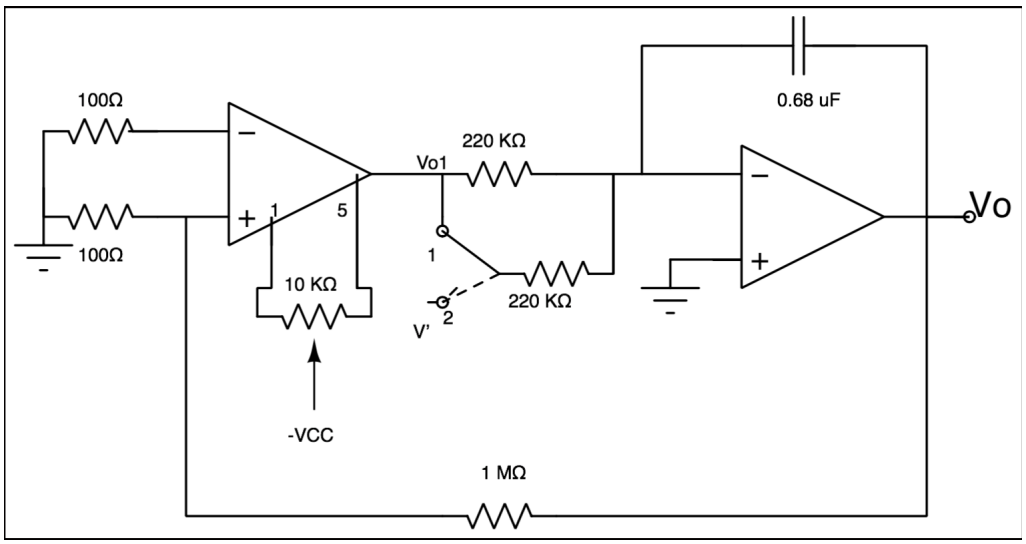
$Vo = 0.347V$
$I_{b-} = 3.47X10^{-8}A$



for measuring Ib+

$Vo = 0.340V$
$I_{b+} = 3.40X10^{-8}A$
The circuit connections were quit easy.

3.2 DC open-loop gain measurement



for measuring open loop gain

$V_{oa} = 5.83V$
$V_{ob} = 5.92V$ when $V_{o1} = 0$
$A_v = 1.11X10^5$

We measured the value of the pot. Ratio of the resistance came out to be 1:2. It was difficult to minimize Vo as it was changing rapidly. So in order to do null adjustment we made V_{o1} zero by varying resistance through pot.

4 Questions for reflection

1. If the method for null-adjustment is as simple as the one you performed in lab, why isn't the 741 op-amp sold with the offset voltage internally calibrated?
Ans. Offset voltage of a opamp depends on its internal characteristics. It is also temperature dependent, so it can not be calibrated .

2. If the temperature in the lab were different from what it was when you performed the experiment, do you expect the pot value you ended up with will still give you offset nullification? Explain your answer. Hint: Look at the internal circuit diagram and figure out what parameters may change when

the temperature changes.
Ans.Voltage offset increases as we increase the temperature

3. What is the slew-rate of an op-amp? Read up the definition and explain it in your own words here. Could you suggest an experiment to measure slew-rate of op-amp 741?
Ans. The slew rate of an op amp of change in the output voltage caused by a step change on the input. Connect a square wave on the inverting side of the opamp and short the inverting and the output terminal of opamp.
slew rate will be change in output voltage divided by time taken for that change

4. What is the role of capacitor C in the circuit you used in the second part of the lab (i.e. in figure 8 of the hand-out)? (Hint: there is a statement in the hand-out mentioning why C is connected; could you explain why that statement is true?)
Ans. The capacitor C prevents the circuit from oscillating. As there will be positive feedback to the op-amp if there is no capacitor. if there is positive feed back then the output of an opamp will ossilate. It will behave as an Schmitt trigger if capacitor is absent.
Also as there is an open circuit therefore it will create unwanted noise. The capacitor will block the noise.