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| **Course Name:** | **Elements of Electrical and Electronics Engineering** | **Semester:** | **I** |
| **Date of Performance:** | **30 /12 / 2022** | **Batch No:** | **C3-3** |
| **Faculty Name:** | **Annu Abraham** | **Roll No:** | **16010122221** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** | **/ 25** |

**Experiment No: 10**

**Title:** **Adder and Non-inverting amplifier using OPAMP**

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| **Aim and Objective of the Experiment:** |
| * To understand the open loop configuration of OPAMP * To understand the concept of negative feedback and closed loop configuration of OPAMP. * To understand inverting and Non-inverting amplifier of OPAMP * To find gain of inverting and non-inverting amplifiers |
| Link for V-Lab:  <https://www.svce.ac.in/amplifier741/simulation.html>  <https://portal.coepvlab.ac.in/vlab/auth/home?dept=2&lab=1> |

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| **COs to be achieved:** |
| **CO5:** Understand operational amplifier and its applications |

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| **Circuit Diagram/ Block Diagram:** |
| **Pin diagram of IC 741**    Pin Configuration of 741 Op-amp Diagram    **1. Inverting Amplifier**    **2. Non-inverting Amplifier**    **Observation Table:**   1. **Inverting Amplifier: DC input Voltage**  |  |  |  |  | | --- | --- | --- | --- | | **Sr. No.** | **Vout (V)** | **Vout (V)** | **Current(mA)** | | **1.** | **1** | **-5** | **0.0571** | | **2.** | **2** | **-10** | **0.0114** | | **3.** | **3** | **-15** | **0.0171** | | **4.** | **4** | **-20** | **0.0229** | | **5.** | **5** | **-25** | **0.0286** | | **6.** | **6** | **-30** | **0.0343** | | **7.** | **7** | **-35** | **0.0400** | | **8.** | **8** | **-40** | **0.0457** | | **9.** | **9** | **-45** | **0.0514** | | **10.** | **10** | **-50** | **0.0571** |  1. **Non-inverting Amplifier: DC input Voltage**  |  |  |  |  | | --- | --- | --- | --- | | **Sr.No.** | **Vin (V)** | **Vout (V)** | **Current(mA)** | | **1.** | **1** | **6** | **0.0667** | | **2.** | **2** | **12** | **0.0133** | | **3.** | **3** | **18** | **0.0200** | | **4.** | **4** | **24** | **0.0267** | | **5.** | **5** | **30** | **0.0333** | | **6.** | **6** | **36** | **0.0400** | | **7.** | **7** | **42** | **0.0467** | | **8.** | **8** | **48** | **0.0533** | | **9.** | **9** | **54** | **0.0600** | | **10.** | **10** | **60** | **0.0667** |   **Post Lab Subjective/Objective type Questions:**  **1. List the characteristics of Ideal operational amplifier.** Infinite Input Resistance The input terminal of an ideal operational amplifier does not have any current to flow in. In electronics, op amps are voltage gain devices. They amplify a voltage fed into the op amp and give out the same signal as output with a much larger gain. In order for an op amp to receive the voltage signal as its input, the voltage signal must be dropped across the op amp. If you know the concept of a voltage divider, voltage drops primarily across components with high impedances, proportionally according to ohm’s law by the formula V=IR. So, the greater the resistance (or impedance) of a device, the greater the voltage drop across that device is. To make sure that the voltage signal drops fully on the op amp, it must have a very high input impedance, so that the voltage drops fully across it. If it had a low input impedance, the voltage may not drop across it and it would not receive the signal. This is why op amps must have high-input impedances. It’s also easy to make the input impedance lower (put a resistor in parallel) or the source impedance higher (put a resistor in series).  Ideal Op Amp Symbol and Transfer Characteristic Curve  Figure 1. Ideal Op Amp Symbol and Transfer Characteristic Curve Zero Output Impedance The output of an ideal op amp is a perfect voltage source, no matter how the current flowing to the amplifier load changes, the output voltage of the amplifier is always a certain value, that is, the output impedance is zero. In practice, zero output impedance is actually a distinct property from infinite input impedance, but for a very long time infinite input impedance was approached only with compromises in offset voltage and noise. Infinite Open-loop Gain In an open-loop state, the differential signal at the input has an infinite voltage gain. This feature makes the operational amplifier very suitable for practical applications with upper negative feedback configuration. Infinite Common-mode Rejection Ratio An ideal operational amplifier can only respond to the difference between the voltages at both ends of V+ and V-. In addition, the same part of the two input signals (ie common mode signal) will be completely ignored. What’s more, a high CMRR is required when a differential signal must be amplified in the presence of a possibly large common-mode input, such as strong electromagnetic interference (EMI). An example is audio transmission over balanced line in sound reinforcement or recording. Infinite Bandwidth The ideal operational amplifier will amplify the input signal of any frequency with the same differential gain, which will not change with the change of signal frequency.  **2. List the important parameters of IC 741 operational amplifier.**  (1) Open loop gain  (2) Input impedance  (3) Output impedance  (4) CMRR  (5) Input Offset voltage and current  (6) Output offset voltage and current  (7) Gain Bandwidth product  (8) Power supply voltage |

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| **Output Snaps:** |
| **Inverting**      **Non-Inverting** |
| **Conclusion:** |
| 1) Thus, using the practical and theoretical values for AC and DC supply the voltage gain for inverting and non-inverting amplifier is confirmed.  2) We learnt to use Op-amp as inverting and non-inverting amplifier |

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| **Signature of faculty in-charge with Date:** |