Department of ECE, Bennett University

CSET102: Introduction to Electrical and Electronics Engineering

Tutorial Sheet-10

Topics Covered: Operational Amplifier

Note: In all these questions, $|V_{CC}| = |V_{EE}| = 15$ V.

Inverting Amplifier:

1) Consider an inverting amplifier, as shown in fig. 1. If $R_1 = 1$ kΩ and $R_2 = 15$ kΩ, find the output voltage if the input voltage is 0.5 V.
2) Consider an inverting amplifier, as shown in fig.1. If $R_1 = 0.5$ kΩ and the input voltage is 0.25 V. What is the maximum permissible value of the resistor R_2?
3) Consider an inverting amplifier, as shown in fig. 1. If $R_2 = 7.5$ kΩ and the input voltage is 0.25 V. What is the minimum permissible value of the resistor R_1?
4) Consider an inverting amplifier, as shown in fig. 1. If $R_1 = 1$ kΩ and $R_2 = 10$ kΩ, what is the maximum permissible value of the voltage at the input?

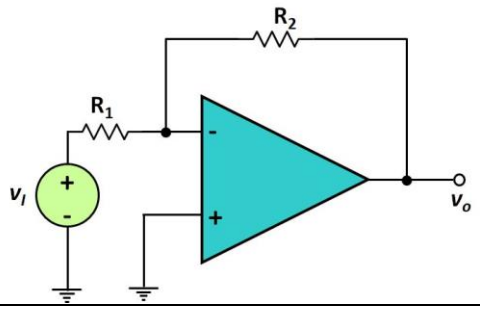

Fig. 1. Inverting Operational Amplifier

5) Consider the non-inverting amplifier, as shown in fig. 2. Given that $R_1 = 1$ kΩ, and $R_2 = 10$ kΩ, find the output voltage if the input voltage is 0.5 V.
6) Consider the non-inverting amplifier, as shown in fig. 2. If $R_1 = 0.5$ kΩ and the input voltage is 0.25 V. What is the maximum permissible value of the resistor R_2?
7) Consider an inverting amplifier, as shown in fig. 2. If $R_2 = 7.5$ kΩ and the input voltage is 0.25 V. What is the minimum permissible value of the resistor R_1?
8) Consider an inverting amplifier, as shown in fig. 2. If $R_1 = 1$ kΩ and $R_2 = 15$ kΩ, what is the maximum permissible value of the voltage at the input?

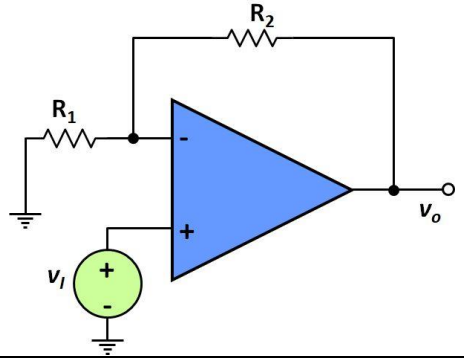

Fig. 2: Non-inverting amplifier

9) Consider a summing amplifier shown in fig. 3. Given that R_1 = 1 kΩ, R_2 = 1.5 kΩ, R_3 = 2 kΩ, and R_F = 10 kΩ. If v_{I1} = 0.5 V, v_{I2} = 0.75 sin(60πt) and v_{I3} = 1.0 sin(30πt), find the output voltage?

10) Consider a summing amplifier shown in fig. 3. Given that the gain of the amplifier is 5. If v_{I1} = 0.25 V, v_{I2} = 0.75 sin(60πt) and v_{I3} = 1.2 sin(30πt). Find the output voltage.

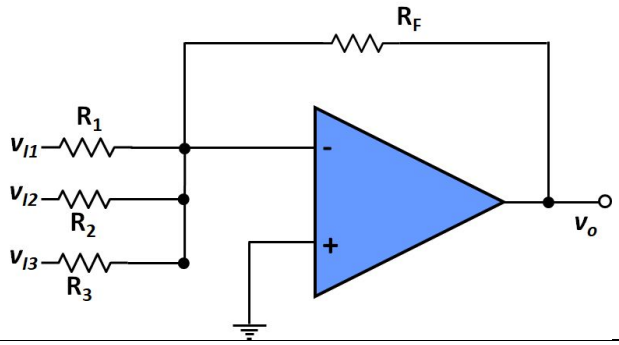

Fig. 3: Summing amplifier

11) Consider the difference amplifier shown in fig. 4. Find the output voltage when V_{I1} = 0.5 V, V_{I2} = 0.55 V, R_1 = 1 kΩ, R_2 = 5 kΩ, R_3 = 3 kΩ and R_4 = 9 kΩ.

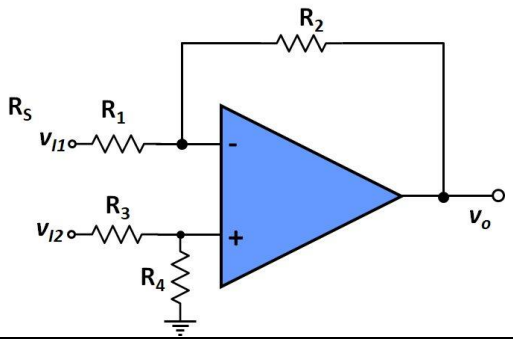

Fig. 4: Difference Amplifier

12) Consider the circuit shown in fig. 5. The input voltage v_s is given by $v_S = 1.0\sin(120\pi t)$. What will be the output voltage. Given R = 1 kΩ C=1 µF.

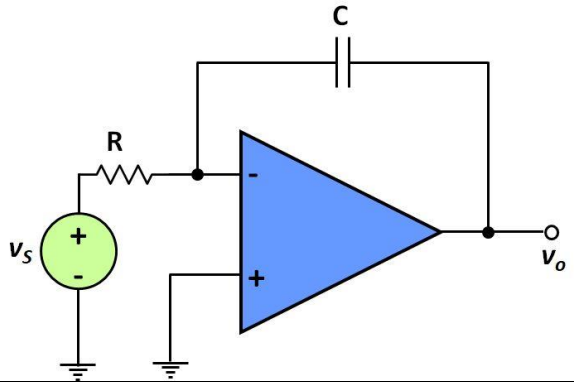

Fig. 5: Operational Amplifier Integrator

13) Consider the circuit shown in fig. 6. The input voltage v_s is given by $v_S = 1.0\sin(120\pi t)$. What will be the output voltage. Given R = 1 kΩ C=1 µF.

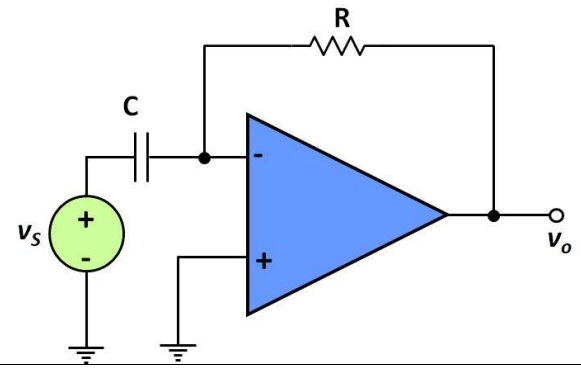

Fig. 6: Operational Amplifier Differentiator