X410993

UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

Department of Electrical Engineering

Operational Amplifiers

## INTRODUCTION

An operational amplifier (or op-amp) is basically a very high-gain, direct-coupled amplifier that uses feedback for control of response characteristics. Today, The availability of inexpensive op-amps has made the packaged op-amp useful as a replacement for any low-frequency amplifier. For example, the same op-amp used for mathematical operations (such as in an analog computer) may be adapted to provide either the broad, flat frequency-gain response required of video amplifiers or the peaked responses required of various types of shaping amplifiers.

From an applications standpoint, an op-amp that has a differential input is much more versatile than a single-input type. This increased versatility results from greater flexibility in selection of the feedback configuration.

The capabilities and limitations of op-amps are firmly defined by a few simple equations and rules, which are based on a certain set of criteria that an op-amp must meet. Effective use of these simple relationships, however, requires knowledge of the conditions under which each is applicable so that errors which may result from various approximations are held to a minimum. Most of the basic design information for a particular op-amp can be obtained from a datasheet.

## ASSIGNMENT

The student is to design and breadboard an inverting op-amp stage having a nominal DC gain of 100. The input-offset voltage is to be measured and frequency-gain data for frequencies from DC to 1 MHz is to be obtained.

The student is to also design and breadboard an op-amp circuit having N-number of stages ($1 < N < 4$) which has a DC gain of 2,000 with a minimum gain of 1,000 at a frequency of 20 KHz.

## REFERENCES

1. References on reserve in the library
2. Textbooks on the subject of electronics and, specifically, on operational amplifiers.
3. Faculty with expertise in the area of electronics.

## EXPECTED RESULTS (as a minimum)

1. Schematics of the op-amp circuits showing all the circuit parameters.
2. Input off-set voltage measurement.
3. Frequency-gain plots for both the single-stage and multiple-stage op-amp circuits.
4. Demonstration of the multi-stage circuit to a faculty member showing the frequency-gain response at low and high frequencies.