

## Experiment 8 INTEGRATOR USING OP-AMP

**AIM:** To design and set up an integrator circuit using op-amp.

**APPARATUS REQUIRED:** Power supply, CRO, function generator, bread board, Op-amp, capacitor, and resistors.

### INTEGRATOR

An inverting amplifier whose output voltage is proportional to the negative integral of the input voltage thereby simulating mathematical integration.

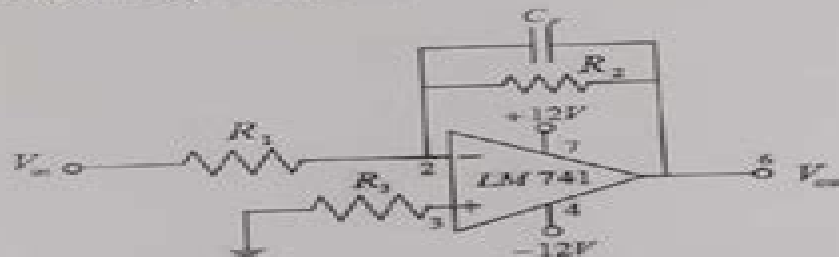
$$V_{out} = -\frac{1}{R_{in}C} \int_0^t V_{in} \cdot dt = -\int_0^t V_{in} \frac{dt}{R_{in} \cdot C}$$

If the Operational Amplifier Integrator is provided with a sine wave input whose frequency is varying, the integrator behaves like a "Low-Pass Filter", which produces only low frequency signal at the output. All the high frequency signal components are blocked or attenuated.

At 0 Hz, the feedback capacitor behaves like an open-circuit, so there is no feedback from the output to the inverting input of the op-amp. Now, the circuit behaves like an open-loop inverting amplifier with very high gain.

### Circuit Diagram

Let  $R_1 = 10K$  ohms,  $R_2 = 100K$  ohms,  $R_3 = 10K$  ohms, and  $C_f = 0.001 \mu f$



### Procedure

1. Set up the integrator circuit as shown in the figure, give square wave of 1v peak to peak, and 1 kHz frequency at the input and observe the input and output simultaneously on the CRO.
2. Repeat the experiment by using a sinusoidal wave and triangular input and observe the output.

# Opamp Lab Manual

**Clement S. Pepper**



## Opamp Lab Manual:

**Laboratory Manual for Introductory Electronics Experiments** L. K. Maheshwari, M. M. S. Anand, 1979 **Lab Manual to Accompany Op-Amps and Linear Integrated Circuits** Ramakant A. Gayakwad, 1999-08-01 This lab manual accompanies Gayakwad's Op Amps and Linear Integrated Circuits **Instructor's solutions manual with transparency masters (includes lab manual results) to accompany Op-amps and linear integrated circuits, fourth edition, Ramakant A. Gayakwad** Ramakant A. Gayakwad, 2000 **Laboratory Manual for Electronic Devices and Circuits** David A. Bell, 2001 This lab manual accompanies Electronic Devices and Circuits 4e **Fundamentals of Electrical and Electronics Engineering | AICTE Prescribed Textbook - English** Susan S. Mathew, Saji T. Chacko, 2021-11-01 Fundamentals of Electrical Electronics Engineering is a compulsory paper for the first year Diploma course in Engineering Technology. Syllabus of this book is strictly aligned as per model curriculum of AICTE and academic content is amalgamated with the concept of outcome based education. Books covers six topics Overview of Electronics Components and Signals Overview of Analog Circuits Overview of Digital Electronics Electric and magnetic Circuits A C Circuits and Transformer and Machines Each topic is written in easy and lucid manner. A set of exercises at the end of each unit to test the student's comprehension is provided. Some salient features of the book are: Content of the book aligned with the mapping of Course Outcomes Programs Outcomes and Unit Outcomes. The practical applications of the topics are discussed along with micro projects and activities for generating further curiosity as well as improving problem solving capacity. Book provides lots of vital facts, concepts, principles and other interesting information. QR Codes of video resources and websites to enhance use of ICT for relevant supportive knowledge have been provided. Student and teacher centric course materials included in book in balanced manner. Figures, tables, equations and comparative charts are inserted to improve clarity of the topics. Objective questions and subjective questions are given for practices of students at the end of each unit. Solved and unsolved problems including numerical examples are solved with systematic steps. *Lab Manual to Accompany Op-amps and Linear Integrated Circuits, Fourth Edition* Ramakant A. Gayakwad, 2000 *Op Amps and Linear Integrated Circuits for Technicians* Frank R. Dungan, 1992 *Op Amp Applications Handbook* Walt Jung, 2005 A complete and up to date op amp reference for electronics engineers from the most famous op amp guru **Op Amps and Linear Integrated Circuits** James M. Fiore, 2001 Divided into two major sections this guide's coverage is current and computer simulations via SPICE and Multisim are integrated throughout to provide experiences similar to those encountered in industry. Fundamentals are stressed in order to set up readers for success. Computer simulations are integrated as a means of verifying a by hand calculation enabling readers to perform what if experiments, test the validity of differing device models or investigate second order effects. Op Amps and Linear Integrated Circuits Richard A. Honeycutt, 1988 **A Circuit Grammar for Operational Amplifier Design** Andrew Lewis Ressler, 1984 Electrical circuit designers seldom create really new topologies

or use old ones in a novel way Most designs are known combinations of common configurations tailored for the particular problem at hand In this thesis I show that much of the behavior of a designer engaged in such ordinary design can be modeled by a clearly defined computational mechanism executing a set of stylized rules Each of my rules embodies a particular piece of the designer's knowledge A circuit is represented as a hierarchy of abstract objects each of which is composed of other objects The leaves of this tree represent the physical devices from which physical circuits are fabricated By analogy with context free languages a class of circuits is generated by a phrase structure grammar of which each rule describes how one type of abstract object can be expanded into a combination of more concrete parts Circuits are designed by first postulating an abstract object which meets the particular design requirements This object is then expanded into a concrete circuit by successive refinement using rules of my grammar There are in general many rules which can be used to expand a given abstract component Analysis must be done at each level of the expansion to constrain the search to a reasonable set

*Basic Operational Amplifier Circuits for Analytical Chemical Instrumentation* Lawrence Philip Morgenthaler, 1968      Simulations for Operational Amplifiers Using Electronics Workbench James L. Antonakos, 1998

Appropriate as a supplement to op amp and devices courses where Electronics Workbench is used This hands on electronics lab manual presents a variety of computer based simulations of electronic circuitry analog and digital within an easy to learn and use virtual environment using Electronics Workbench      **Lab Manual for Electronics** Martin Feldman, 2001-11 The emphasis is first on understanding the characteristics of basic circuits including resistors capacitors diodes and bipolar and field effect transistors The readers then use this understanding to construct more complex circuits such as power supplies differential amplifiers tuned circuit amplifiers a transistor curve tracer and a digital voltmeter In addition readers are exposed to special topics of current interest such as the propagation and detection of signals through fiber optics the use of Van der Pauw patterns for precise linewidth measurements and high gain amplifiers based on active loads

**KEY TOPICS**

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more advanced study Real world color codes and strategic highlighting are integrated with ample color charts photos schematics and diagrams for a solid understanding of circuit behavior that equips readers to progress to more complex topics with ease This edition features all new automated calculations for the formulas in the book on the accompanying CD as well as new information on admittance susceptance and more     *Activities Manual for Digital Electronics* Roger L. Tokheim,1984

*Experiments in Analog and Digital Electronics* Thomas E. Brewer,2004-07-09     *Foundations of Electronics and Circuits and Devices* Russell L. Meade,1994     **Op-Amp Circuits Manual** R. M. Marston,2013-10-22 Op amp Circuits Manual

Including OTA circuits discusses the operating principles and applications of operational amplifier op amp circuits The book is comprised of 10 chapters that present practical circuits diagrams and tables The text first deals with the standard op amp of the 741 type Next the book covers the special types of op amp such as the Norton amplifier the operational transductance amplifier OTA and the LM 10 op amp reference IC The book will be of great use to design engineers and technicians

Undergraduate students of electronics related degree will also find this book interesting     **Build Your Own Home Lab** Clement S. Pepper,1997 This book shows you how to assemble an efficient working home lab inexpensively and how to make it pay for itself through years of growth and use Includes many projects for creating your own instruments including a multichannel oscilloscope switch and a 100 minute timer stopwatch

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