

Experiment 5 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.

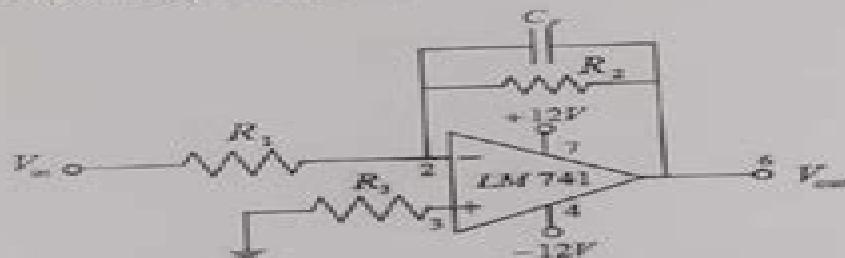
$$V_{out} = -\frac{1}{R_s C} \int V_{in} \cdot dt = -\int V_{in} \frac{dt}{R_s \cdot C}$$

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 Diagrams

Let $R_1 = 10K$ ohms, $R_2 = 100K$ ohms, $R_s = 10K$ 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 accompanie s 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 4 e **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 is easy and lucid manner A set of exercises at the end of each units to test the student s comprehension is provided Some salient features of the book l Content of the book aligned with the mapping of Course Outcomes Programs Outcomes and Unit Outcomes l 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 l Book provides lots of vital facts concepts principles and other interesting information l QR Codes of video resources and websites to enhance use of ICT for relevant supportive knowledge have been provided l Student and teacher centric course materials included in book in balanced manner l Figures tables equations and comparative charts are inserted to improve clarity of the topics l 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
Chapter topics include Thevenin's Theorem, Resistive Voltage Division, Silicon Diodes, Resistor Capacitor Circuits, Half Wave Rectifiers, DC Power Supplies, Diode Applications, Bipolar Transistors, Field Effect Transistors, Characterization of Op Amp Circuits, Transistor Curve Tracer, Introduction to PSPICE and AC Voltage Dividers, Characterization and Design of Emitter and Source Followers, Characterization and Design of an AC Variable Gain Amplifier, Design of Test Circuits for BJT's and FET's, and Design of FET Ring Oscillators. Design and Characterization of Emitter Coupled Transistor Pairs, Tuned Amplifier and Oscillator, Design of Am Radio Frequency Transmitter and Receiver, Design of Oscillators Using Op Amps, Current Mirrors and Active Loads, Sheet Resistance Design of Analog Fiber Optic Transmission System, Digital Voltmeter.

Foundations of Electronics Russell L. Meade, 1999
Learn electronics fundamentals for both DC and AC circuits from Ohms Law through series and parallel resonant circuits. This highly acclaimed introduction to the world of electronics technology has been carefully updated to better provide technicians with a foundation in modern electronics needed to launch a career or pursue

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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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