Pre-Lab 1: Half-Wave Rectifier

INTRODUCTION

Diodes are a critical part of DC power supplies. The half-wave rectifier is the simplest type of AC-to-DC converter. The overall goal of PreLab1 is to simulate some half-wave rectifier circuits that you will test during the lab session.

GENERAL GUIDELINES

- 1) Each student must turn in his/her own Pre-Lab assignment (include both schematics and waveforms).
- Students are allowed (even encouraged) to work together. However, you must turn in your own work? Turning in multiple printouts of the same schematic/waveforms (with different student names) will result in ZERO points.
- You will be using the program Multisim for all simulations. The program is installed on all of the computers in N100, N102, and N106.

NOTE: There will be two lab exams during the term. Each lab exam will test each student's ability to use Multisim and build/test a circuit.

PART 1: HALF-WAVE RECTIFIER

TASK 1a: Simulate the half-wave rectifier shown below. Use the tutorial on the WEB site to get started.

- The voltage source is a sine wave generator (10V_{FF}, 60 Hz) in series with a 50 ohm resistor. This is a pretty good approximation of the Agilent 33220 function generators in N100.
- Note that 10 V_{PP} means peak-to-peak, so the sine wave amplitude is actually 5 V.
- The 1N4002 diode can be selected from the place menu by selecting: component | Diodes | Diode | 1N4004G.
- The resistor is 10 kohm.
- From the menu bar select: simulate | Analysis | Transient. Set the End Time to .05 s and the minimum number of points to 1000.
- After running the simulation a "Grapher" screen will pop up. Turn on the Grid. From the Cursor menu select show cursers and then select to the next Y MAX =>. After the cursor goes to the maximum point select Add Data Label at Cursor.
- Your simulated waveform should look like the graph shown below.
- Turn in both the schematic and waveform.





Figure 1: Circuit schematic and simulated load voltage.

Rectifier Lab Manual

Julia Schneider

Rectifier Lab Manual:

Laboratory Manual for Introductory Electronics Experiments L. K. Maheshwari, M. S. Anand, 1979 **ELECTRONICS LAB MANUAL (VOLUME 2)** NAVAS, K. A., 2018-10-01 This book is evolved from the experience of the author who taught all lab courses in his three decades of teaching in various universities in India The objective of this lab manual is to provide information to undergraduate students to practice experiments in electronics laboratories This book covers 118 experiments for linear analog integrated circuits lab communication engineering lab power electronics lab microwave lab and optical communication lab The experiments described in this book enable the students to learn Various analog integrated circuits and their functions Analog and digital communication techniques Power electronics circuits and their functions Microwave equipment and components Optical communication devices This book is intended for the B Tech students of Electronics and Communication Engineering Electrical and Electronics Engineering Biomedical Electronics Instrumentation and Control Computer Science and Applied Electronics It is designed not only for engineering students but can also be used by BSc MSc Physics and Diploma students KEY FEATURES Contains aim components and equipment required theory circuit diagram pin outs of active devices design tables graphs alternate circuits and troubleshooting techniques for each experiment Includes viva voce and examination guestions with their answers Provides exposure on various devices TARGET AUDIENCE B Tech Electronics and Communication Engineering Electrical and Electronics Engineering Biomedical Electronics Instrumentation and Control Computer Science and Applied Electronics BSc MSc Physics Diploma Engineering **Lab Manual** Tony Lab Manual for Electronics Martin Feldman, 2001-11 The emphasis is first on understanding the Cook, 1998-10-19 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 Lab Manual Latest Edition Dr. J. P. Goel, 2016-12-17 Lab E Manual Physics For XIIth Practicals A Every student will perform 10 experiments 5 from each section

8 activities 4 from each section during the academic year Two demonstration experiments must be performed by the teacher with participation of students The students will maintain a record of these demonstration experiments B Evaluation Scheme for Practical Examination One experiment from any one section 8 Marks Two activities one from each section 4 4 8 Marks Practical record experiments activities 6 Marks Record of demonstration experiments Viva based on these experiments 3 Marks Viva on experiments activities 5 Marks Total 30 Marks Section A Experiments 1 To determine resistance per cm of a given wire by plotting a graph of potential difference versus current 2 To find resistance of a given wire using metre bridge and hence determine the specific resistance of its material 3 To verify the laws of combination series parallel of resistances using a metre bridge 4 To compare the emf of two given primary cells using potentiometer 5 To determine the internal resistance of given primary cells using potentiometer 6 To determine resistance of a galvanometer by half deflection method and to find its figure of merit 7 To convert the given galvanometer of known resistance and figure of merit into an ammeter and voltmeter of desired range and to verify the same 8 To find the frequency of the a c mains with a sonometer Activities 1 To measure the resistance and impedance of an inductor with or without iron core 2 To measure resistance voltage AC DC current AC and check continuity of a given circuit using multimeter 3 To assemble a household circuit comprising three bulbs three on off switches a fuse and a power source 4 To assemble the components of a given electrical circuit 5 To study the variation in potential drop with length of a wire for a steady current 6 To draw the diagram of a given open circuit comprising at least a battery resistor rheostat key ammeter and voltmeter Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram Section B Experiments 1 To find the value of v for different values of u in case of a concave mirror and to find the focal length 2 To find the focal length of a convex lens by plotting graphs between u and v or between 1 u and 1 u 3 To find the focal length of a convex mirror using a convex lens 4 To find the focal length of a concave lens using a convex lens 5 To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation 6 To determine refractive index of a glass slab using a travelling microscope 7 To find refractive index of a liquid by using i concave mirror ii convex lens and plane mirror 8 To draw the I V characteristic curve of a p n junction in forward bias and reverse bias 9 To draw the characteristic curve of a zener diode and to determine its reverse break down voltage 10 To study the characteristics of a common emitter npn or pnp transistor and to find out the values of current and voltage gains Activitie 1 To study effect of intensity of light by varying distance of the source on a L D R 2 To identify a diode a LED a transistor and IC a resistor and a capacitor from mixed collection of such items 3 Use of multimeter to i identify base of transistor ii distinguish between npn and pnp type transistors iii see the unidirectional flow of current in case of a diode and a LED iv check whether a given electronic component e g diode transistor or I C is in working order 4 To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab 5 To observe polarization of liquid using two Polaroids 6 To observe diffraction of light due to a thin slit 7 To study

the nature and size of the image formed by i convex lens ii concave mirror on a screen by using a candle and a screen for different distances of the candle from the lens mirror 8 To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses Suggested Investigatory Projects 1 To investigate whether the energy of a simple pendulum is conserved 2 To determine the radius of gyration about the centre of mass of a metre scale as a bar pendulum 3 To investigate changes in the velocity of a body under the action of a constant force and determine its acceleration 4 To compare effectiveness of different materials as insulators of heat 5 To determine the wavelengths of laser beam by diffraction 6 To study various factors on which the internal resistance emf of a cell depends 7 To construct a time switch and study dependence of its time constant on various factors 8 To study infrared radiations emitted by different sources using photo transistor 9 To compare effectiveness of different materials as absorbers of sound 10 To design an automatic traffic signal system using suitable combination of logic gates 11 To study luminosity of various electric lamps of different powers and make 12 To compare the Young's modulus of elasticity of different specimens of rubber and also draw their elastic hysteresis curve 13 To study collision of two balls in two dimensions 14 To study frequency response of i a resistor an inductor and a capacitor ii RL circuit iii RC circuit iv LCR series circuit **Basic Electronics Engineering** Satya Sai Srikant, Prakash Kumar Chaturvedi, 2020-04-27 This book is primarily designed to serve as a textbook for undergraduate students of electrical electronics and computer engineering but can also be used for primer courses across other disciplines of engineering and related sciences The book covers all the basic aspects of electronics engineering from electronic materials to devices and then to basic electronic circuits The book can be used for freshman first year and sophomore second year courses in undergraduate engineering It can also be used as a supplement or primer for more advanced courses in electronic circuit design The book uses a simple narrative style thus simplifying both classroom use and self study Numerical values of dimensions of the devices as well as of data in figures and graphs have been provided to give a real world feel to the device parameters It includes a large number of numerical problems and solved examples to enable students to practice A laboratory manual is included as a supplement with the textbook material for practicals related to the coursework The contents of this book will be useful also for students and enthusiasts interested in learning about basic electronics without the benefit of formal coursework *Industrial Electronics: A Text-lab Manual Paul B. Zbar*,1972 Power Electronics. A First Course Ned Mohan, Siddharth Raju, 2023-01-12 POWER ELECTRONICS A FIRST COURSE Enables students to understand power electronics systems as one course in an integrated electric energy systems curriculum Power Electronics A First Course provides instruction on fundamental concepts related to power electronics to undergraduate electrical engineering students beginning with an introductory chapter and moving on to discussing topics such as switching power poles switch mode dc dc converters and feedback controllers The authors also cover diode rectifiers power factor correction PFC circuits and switch mode dc power supplies Later chapters touch on soft switching in dc dc power converters voltage

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