5V/1A/5W
DC POWER SOURCE
CIRCUIT AND SYSTEM ANALYSIS COURSE END OF TERM PROJECT

DUE DATE

FINAL EXAM

PROF. DR. HERMAN SEDEF

DR. ÖĞRETİM ÜYESİ ZEHRA GÜLRU ÇAM TAŞKIRAN

WHAT IS REQUESTED IN THE PROJECT?

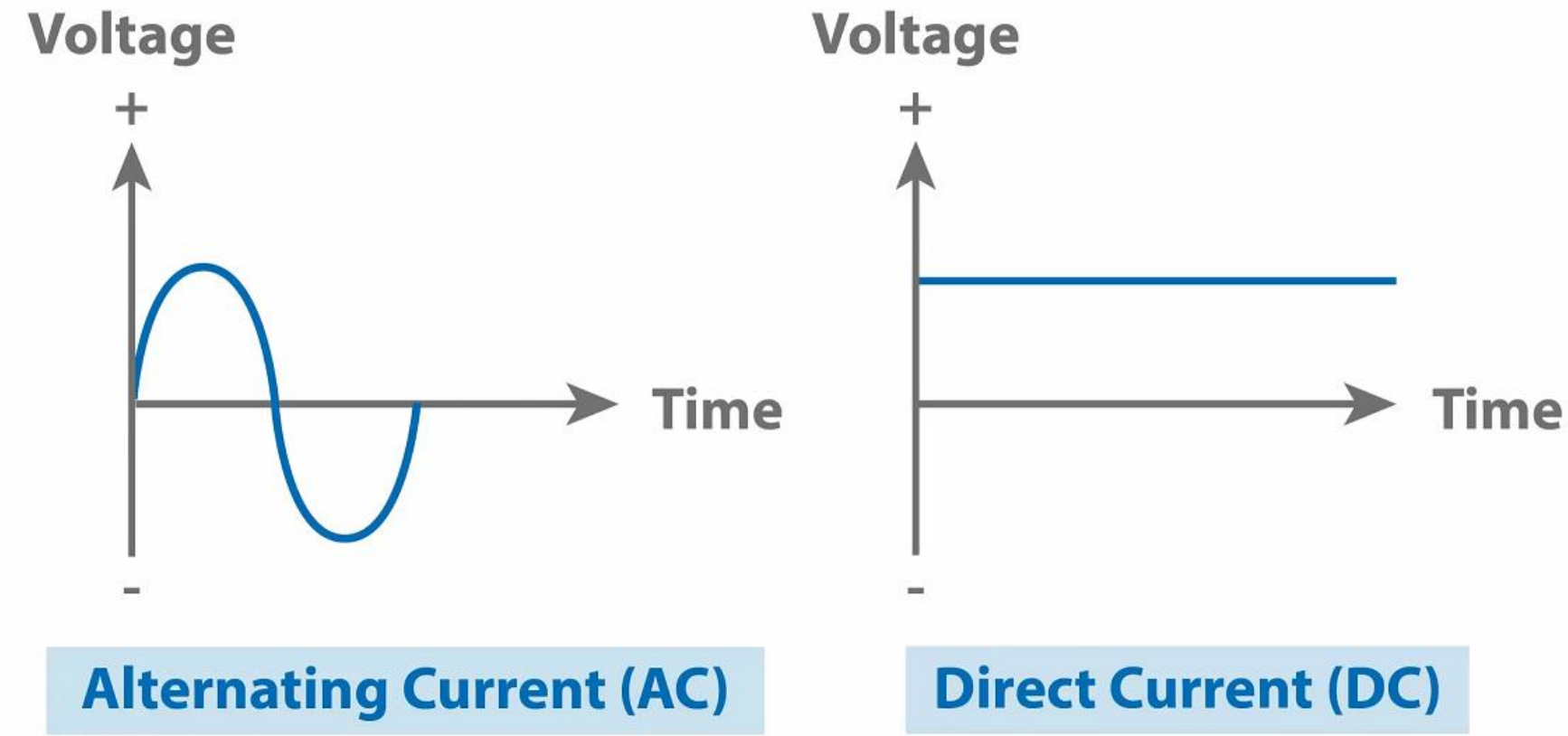
1. DC power supplies will be investigated theoretically and their operation will be learned.
2. When the theoretical research is completed, the DC power supply circuit will be designed. (Element types, element values, operating voltages and powers will be determined)
3. The power supply circuit will be schematically diagrammed and simulated using Orcad or a program known and used by you.
4. When the simulation results are correct, the necessary safety precautions will be taken and the circuit will be run experimentally on the breadboard (necessary loading experiments and measurements will be made).
5. The printed circuit of the power supply circuit running on the board will be prepared and boxed. (For convenience in the printed circuit; if desired, the assembly and soldering of the circuit can be done on perforated copper pertinaxes).
6. A short and concise report (introduction, development, conclusion) describing what has been done in this project should be prepared in accordance with the format in the graduation thesis writing template on the department WEB page (cover page, font sizes, line spacing, figures, tables, equations, etc.).

We wish you luck.

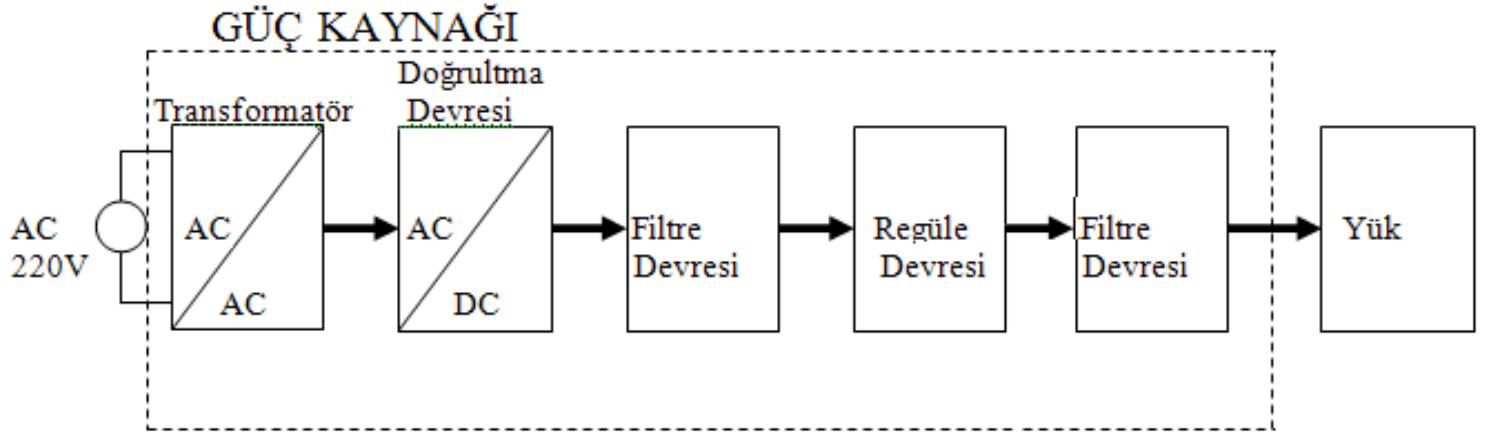
WHY DO WE USE REGULATOR?

- The Majority of Our Devices/Circuits Require DC Power Supply. For example, Mobile Phones, Flashlights, Television Remotes, Televisions, Radios, Computers, Electronic Circuits in Many Electronic Devices, etc.
- In practice, no matter what the load is, that is, no matter how much current is drawn from the source, the voltages of the voltage sources are always desired to remain constant, in other words, to be independent of the load (like the ideal voltage source).
- FOR THIS REASON, REGULATED DC POWER SUPPLIES ARE USED.

AC AND DC WAVEFORMS

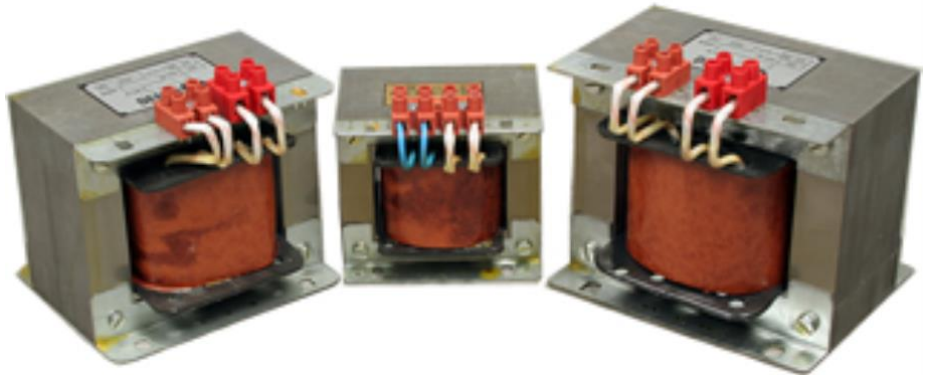


GENERAL BLOCK DIAGRAM OF DC POWER SUPPLY



EACH BLOCK WILL BE BRIEFLY EXPLAINED. YOU CAN FIND DETAILED INFORMATION IN ELECTRONIC COURSE BOOKS.

PHYSICAL IMAGE OF THE TRANSFORMER



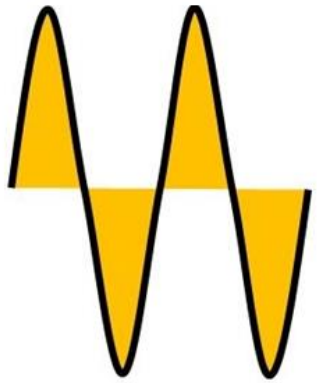
AS INCREASES ITS POWER, ITS DIMENSIONS INCREASE, AND THE APPROPRIATE POWER SHOULD BE SELECTED ACCORDING TO THE DESIGN.
THERE ARE ALSO INSULATED TRANSFORMERS FOR SAFETY.

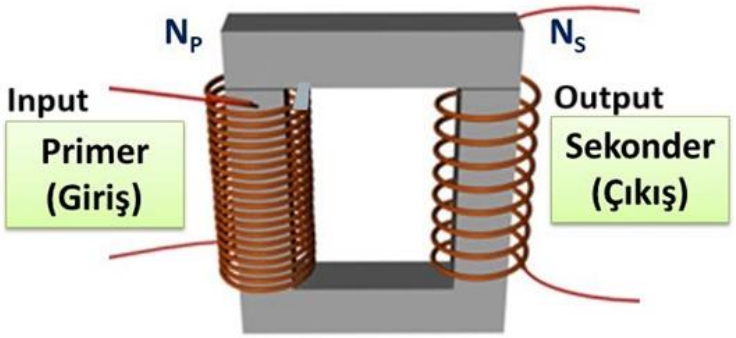
WORKING PRINCIPLE OF THE TRANSFORMER

$$\text{Efficiency\%} = \frac{P_s}{P_p} . 100$$

$$\frac{N_P}{N_S} = \frac{V_P}{V_S} = \frac{I_S}{I_P}$$

THE NUMBER OF TURNS IS N.



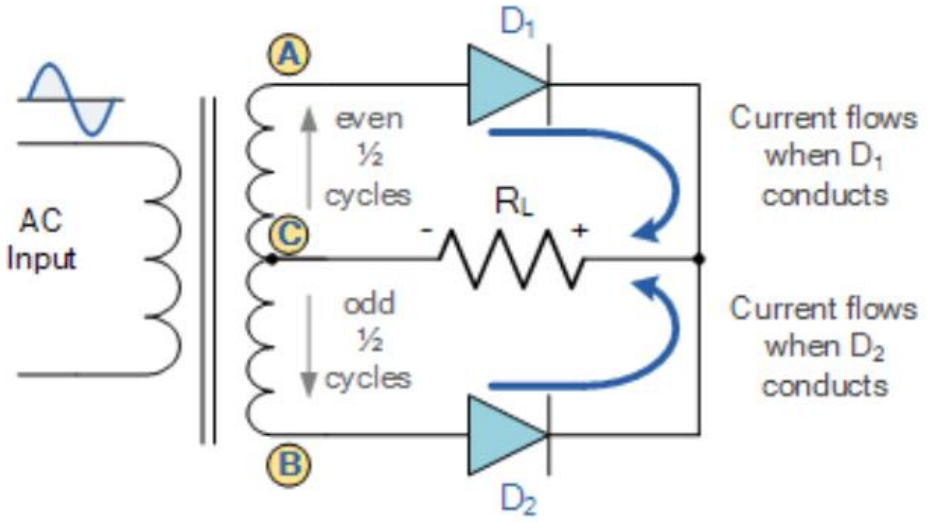


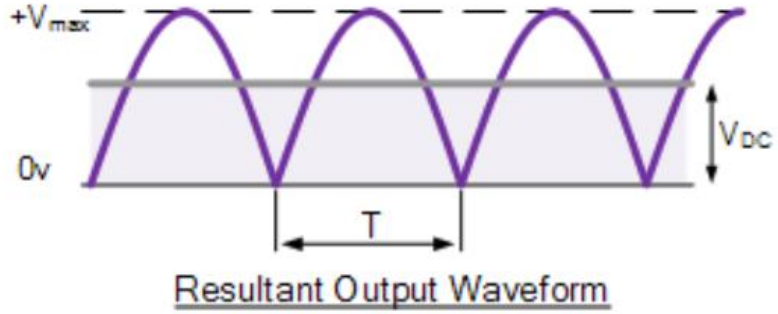
TRANSFORMERS ARE USED TO INCREASE OR DECREASE AC VOLTAGE.
VOLTAGE REDUCER TRANSFORMER WILL BE USED IN THE PROJECT.

CAUTION!!!: WHEN MAKING CONNECTIONS ON THE 220 V HIGH VOLTAGE SIDE OF THE TRANSFORMER, NECESSARY SAFETY PRECAUTIONS SHOULD BE TAKEN AND VERY ATTENTION SHOULD BE PAID TO INSULATION.

RECTIFICATION CIRCUITS

FULL WAVE RECTIFIER WITH TWO SECONDARY TRANSFORMER

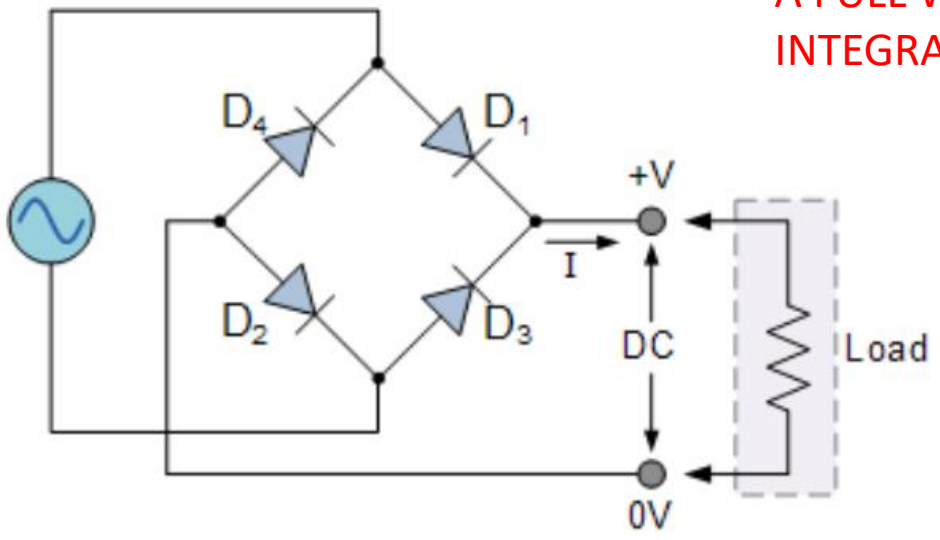




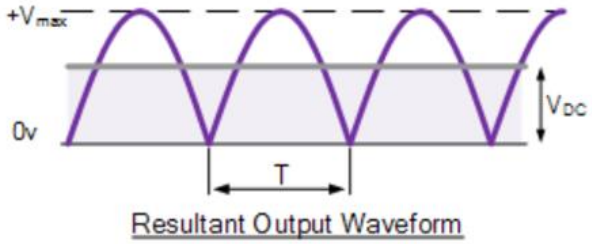
$$V_{d.c.} = \frac{2V_{\max}}{\pi} = 0.637V_{\max} = 0.9V_{RMS}$$

RECTIFICATION CIRCUITS

FULL WAVE RECTIFIER WITH ONE SECONDARY TRANSFORMER AND BRIDGE DIODE



A FULL WAVE RECTIFIER WILL BE USED IN THE PROJECT.
INTEGRATED BRIDGE DIODE CAN BE USED INSTEAD OF 4 DIODES.

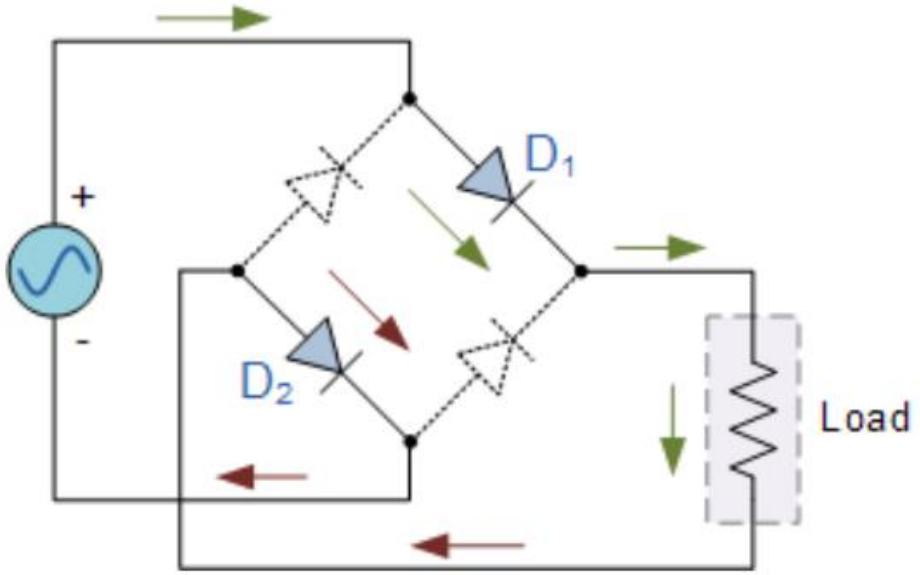


Resultant Output Waveform

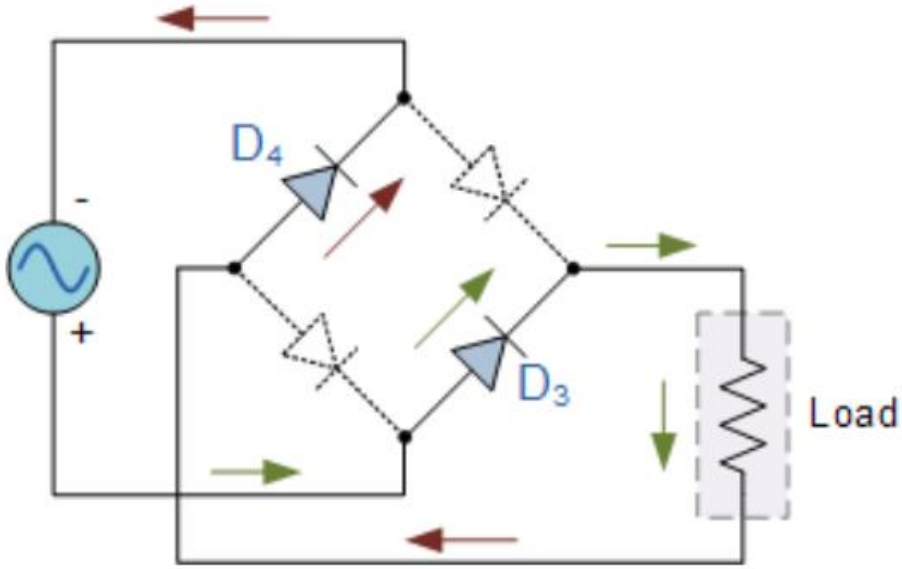
$$V_{d.c.} = \frac{2V_{max}}{\pi} = 0.637V_{max} = 0.9V_{RMS}$$

INTEGRATED BRIDGE DIODE

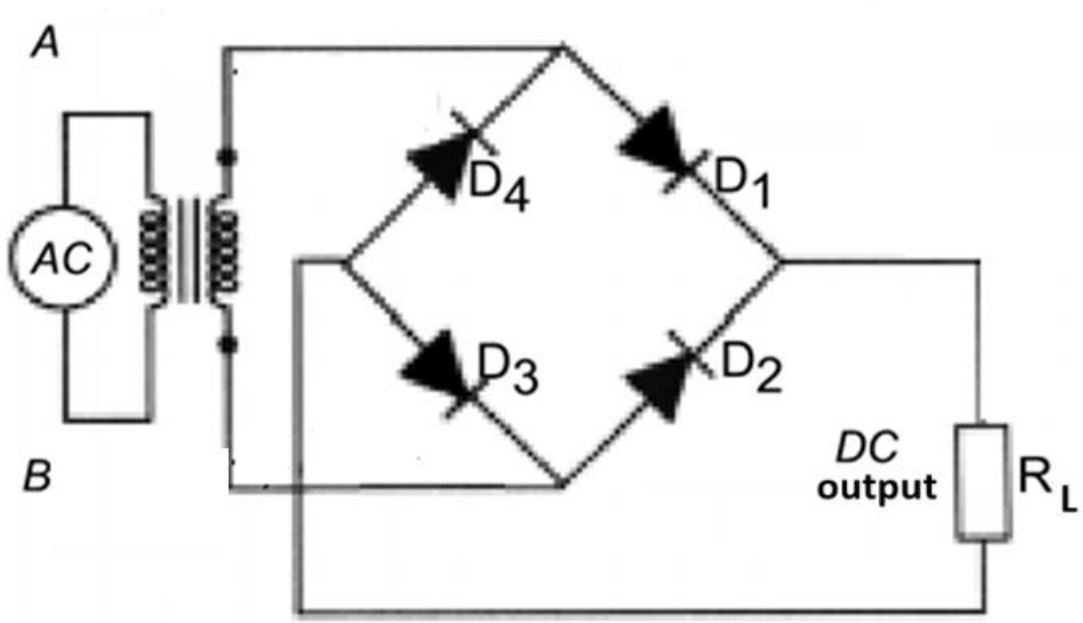
WORKING PRINCIPLE OF FULL WAVE RECTIFIER POSITIVE ALTERNANCE (HALF PERIOD)

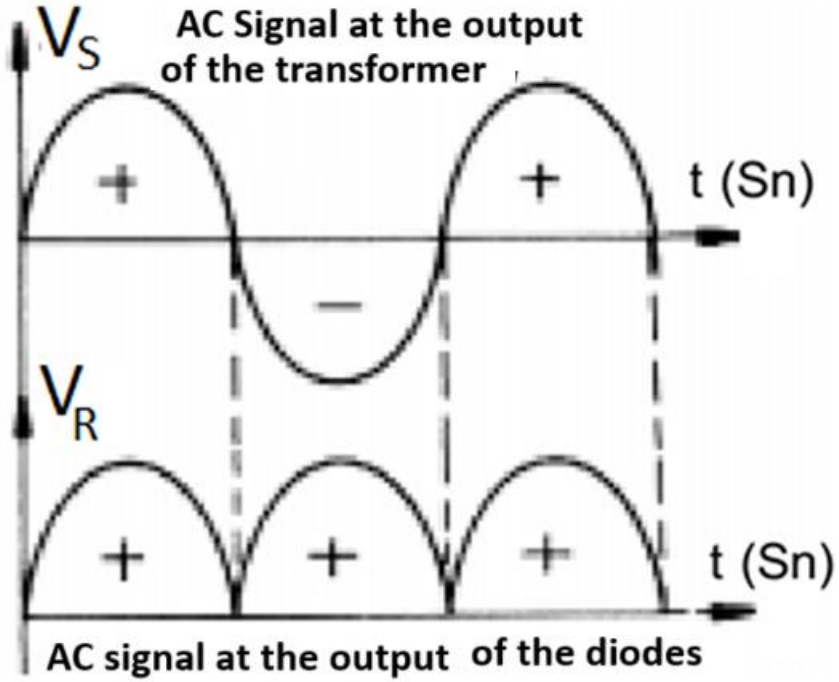


WORKING PRINCIPLE OF FULL WAVE RECTIFIER NEGATIVE ALTERNANCE (HALF PERIOD)



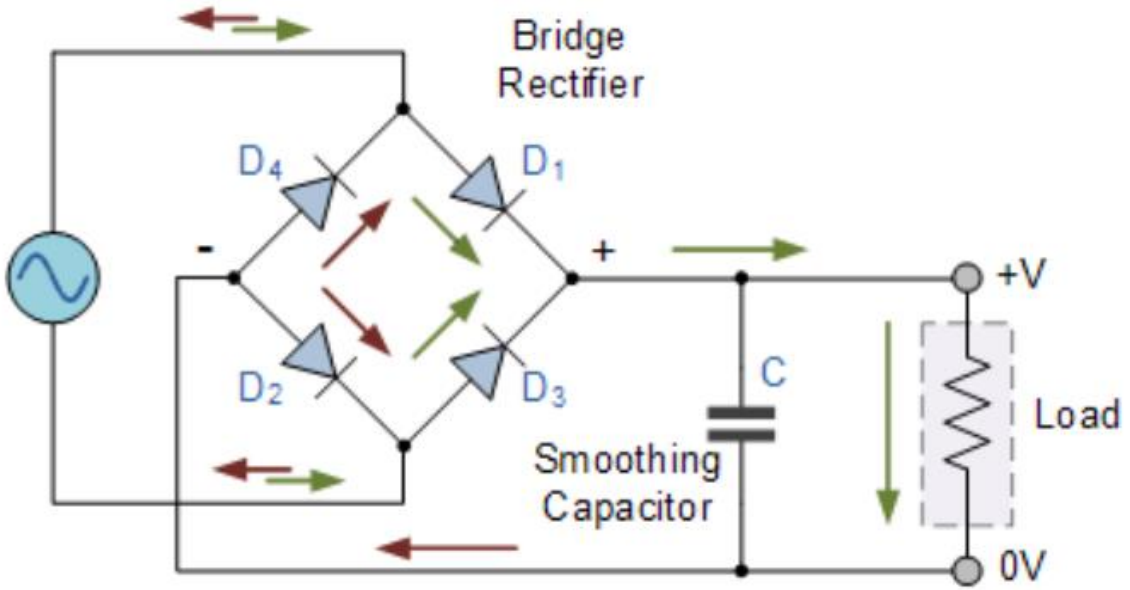
WORKING PRINCIPLE OF FULL WAVE RECTIFIER IN POSITIVE AND NEGATIVE ALTERNANCE

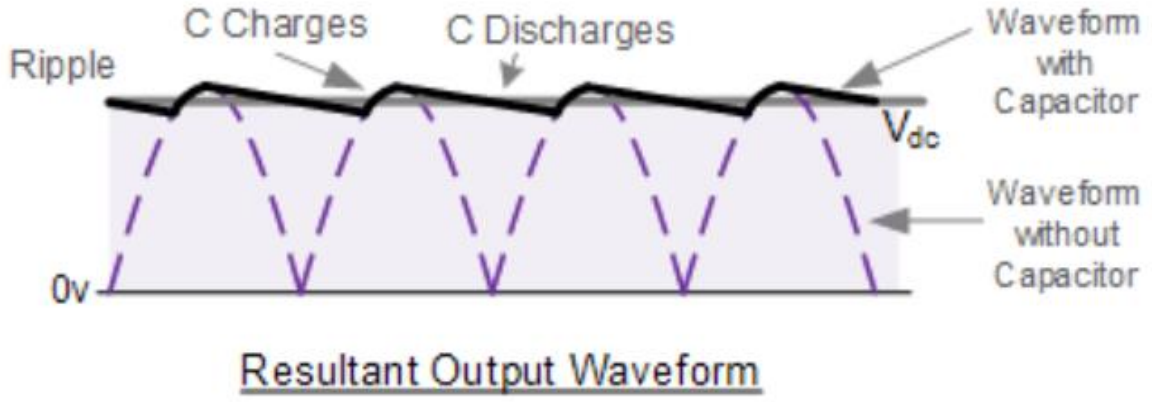




V_{Ry} DC SIGNAL AT THE LOAD RESISTANCE TERMINALS

FULL WAVE RECTIFIER WITH CAPACITY FILTER



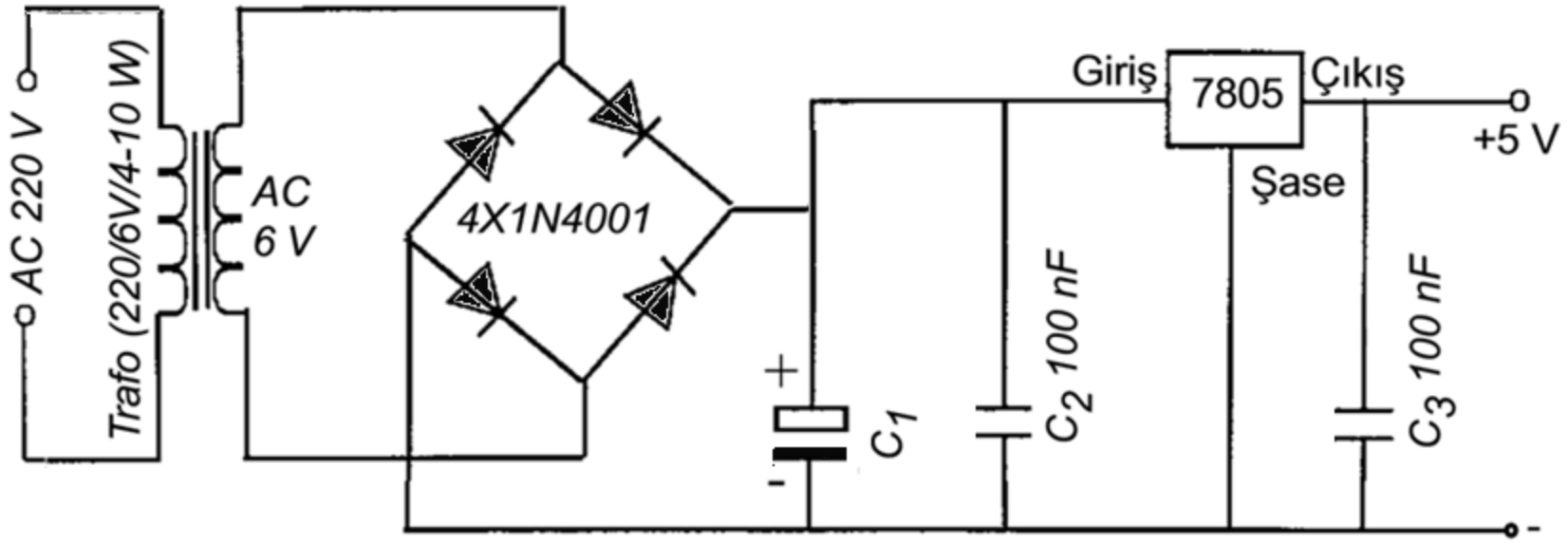


Resultant Output Waveform

$$V_{(ripple)} = \frac{I_{(load)}}{2x\ f \times C} \quad V$$

f=50 Hz NETWORK FREQUENCY

5V/1A 5W DC REGULATOR CIRCUIT TO BE IMPLEMENTED



INTEGRATED BRIDGE DIODE CAN BE USED INSTEAD OF 4 DIODES.
COOLER MUST BE USED TO PREVENT THE 7805 REGULATOR FROM HEATING.
CONSIDERING THE LOSSES IN THE CIRCUIT, TRANSFORMER POWER> 5W SHOULD BE SELECTED.
C1 POLE CAPACITOR SHOULD BE CALCULATED AND ITS CAPACITANCE AND WORKING VOLTAGE SHOULD BE SELECTED FROM STANDARD VALUES ON THE MARKET.

7805 +5V REGULATOR IC

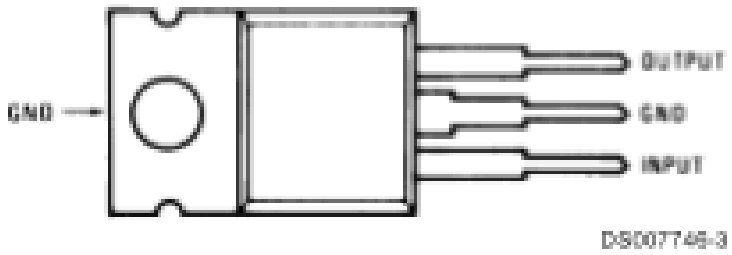
Features

- Output current in excess of 1A
- Internal thermal overload protection
- No external components required
- Output transistor safe area protection
- Internal short circuit current limit
- Available in the aluminum TO-3 package

Voltage Range

LM7805C	5V
LM7812C	12V
LM7815C	15V

Plastic Package
TO-220 (T)



Top View
Order Number LM7805CT,
LM7812CT or LM7815CT
See NS Package Number T03B

FIND THE CATALOGUE (7805.pdf) OF THIS INTEGRATED REGULATOR IC AND EXAMINE ITS DETAILED ELECTRICAL SPECIFICATIONS, PIN CONNECTIONS AND APPLICATION CIRCUIT.

INTERNAL STRUCTURE OF 7805 REGULATOR IC