Dr Department of Electrical Engineering Midterm Exam
Date: 25/04/2020

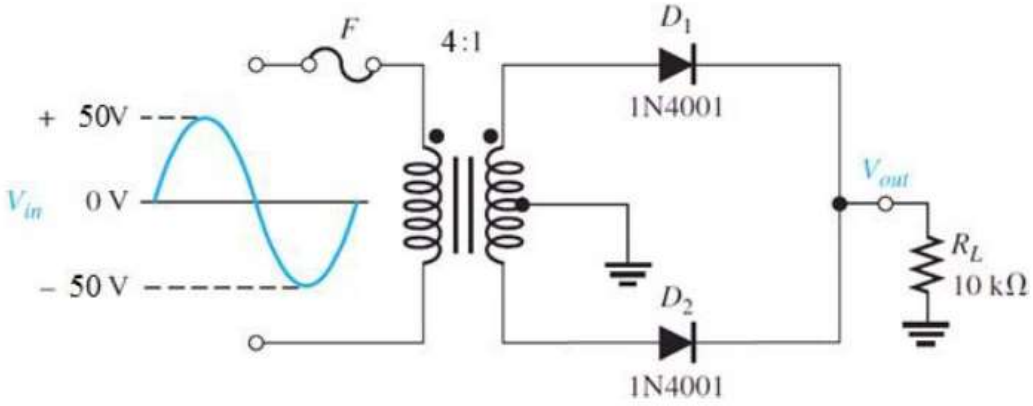
Course Details

Course Title: Electronic Devices and Circuits **Module:** Summer
Instructor: Dr Shehryar **Total Marks:** 30

Student Details

Name: M.Salman shahid **Student ID:** 15006

Student Signature: _____

Q1.		**For the circuit given in figure 1, answer and solve following problems.** a) What type of circuit is this? (1) b) What is the total peak secondary voltage? (1) c) Find the peak voltage across each half of the secondary. (1) d) What is the peak current through each diode? (2) e) What minimum PIV rating must the diodes have? (2)  **Figure 1**	Marks 07 CLO 02
Q2.		Determine the ripple factor for the filtered bridge rectifier with a load as indicated in Figure 2	Marks 05 CLO 02

Q1:-

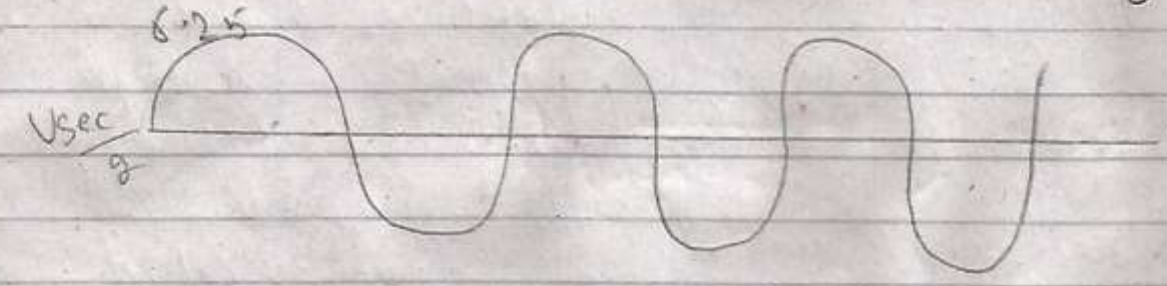
a) This a center Tapped full wave Rectifier Circuit.

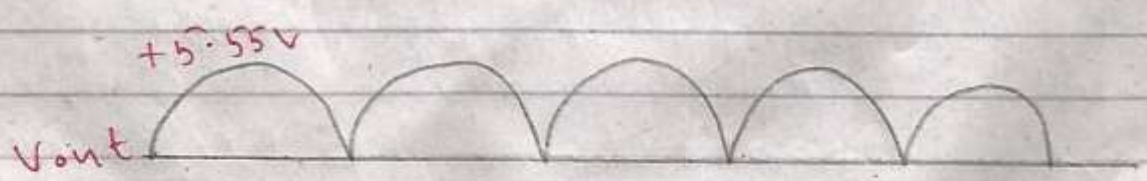
b) Total Peak Secondry Voltage

$V_{p(sec)} = n V_{p(Pri.)} = 0.25\,(50) = 12.5V$

$V_{p(sec)} = 12.5\,V$

c) Peak voltage across each of the half of the secondry





There is 6.25V Peak to Peak voltage the output voltage has a Peak value of $6.25 - 0.7 = 5.55V$ which is diode drop.

d) Peak current through each diode

$$I_f = \frac{\frac{V_{p(sec)}}{2} - 0.7}{R_L} = \frac{5.55\,V}{10k\Omega} = 0.00055$$

$I_f = 0.555\,mA$

e) Minimum PIV rating must diode have

$$PIV = 2V_{p(out)} + 0.7$$
$$= 2(5.55V) + 0.7$$
$$= 11.8V$$

Q2. Determine the ripple factor for the filtered bridge rectifier with a load as indicated in Figure 2 | Marks 05 | CLO 02

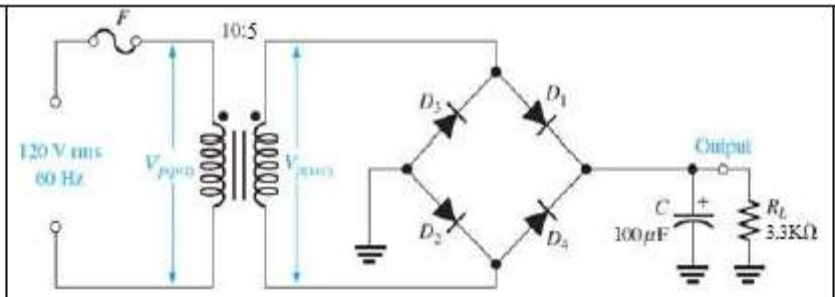


Figure 2

Q2.

= ?

Soln- Transformer Turns ratio is n = 0.5

Peak Primary Voltage

=> $V_{p(Pri)} = V_{RMS} \times \sqrt{2}$

$= 120 \times 1.414 = 170V$

$V_{p(Pri)} = 170V$

=> Peak Secondry voltage

$V_{p(sec)} = (0.5)(170) = 85V$

=> The unfiltered full wave rectified voltage

$V_{p(rect)} = V_{p(sec)} - 1.4V = 85V - 1.4 = 83.6$

=

=> The frequency of full wave rectified voltage is 120 Hz

$$V_{r(PP)} = \left(\frac{1}{fRLC}\right) V_{p(rect)}$$

$$= \left(\frac{1}{(120Hz)(3300\Omega)(100uf)}\right) 83.6$$

$$V_{r(PP)} = 2.111$$

=> The approx dc value of output voltage is determined as

$$V_{DC} = \left(1 - \frac{1}{2fRLC}\right) V_{p(rect)}$$

$$= \left(1 - \frac{1}{2(120)(3300\Omega)(100uf)}\right) 83.6$$

$$V_{DC} = 82.544$$

resulting ripple factor

$$\gamma = \frac{V_{r(PP)}}{V_{DC}} = \frac{2.11}{82.544} = 0.02556$$

Q3.		Determine the output voltage waveform for the circuit given in Figure 3	Marks 02 CLO 02

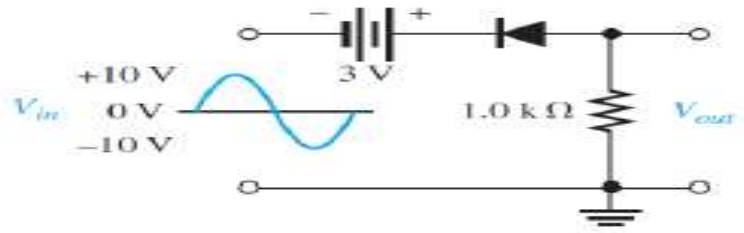
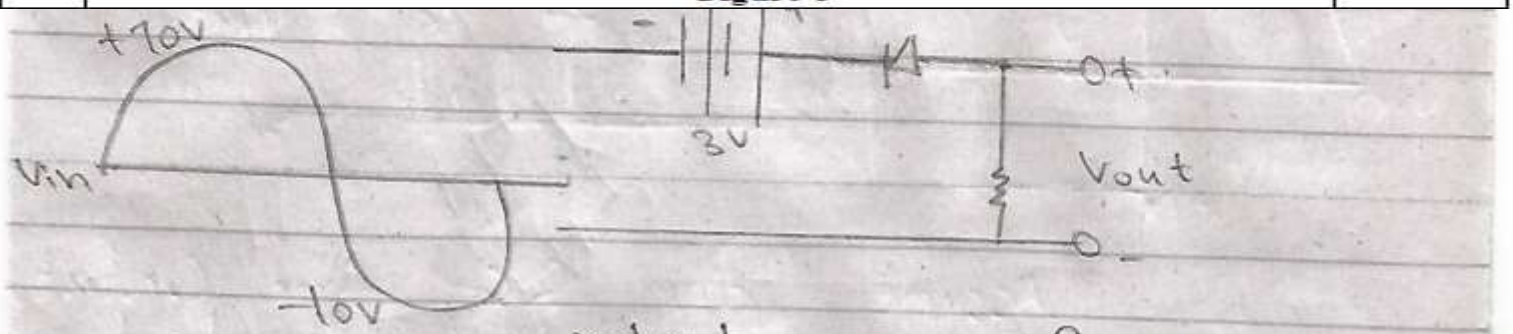
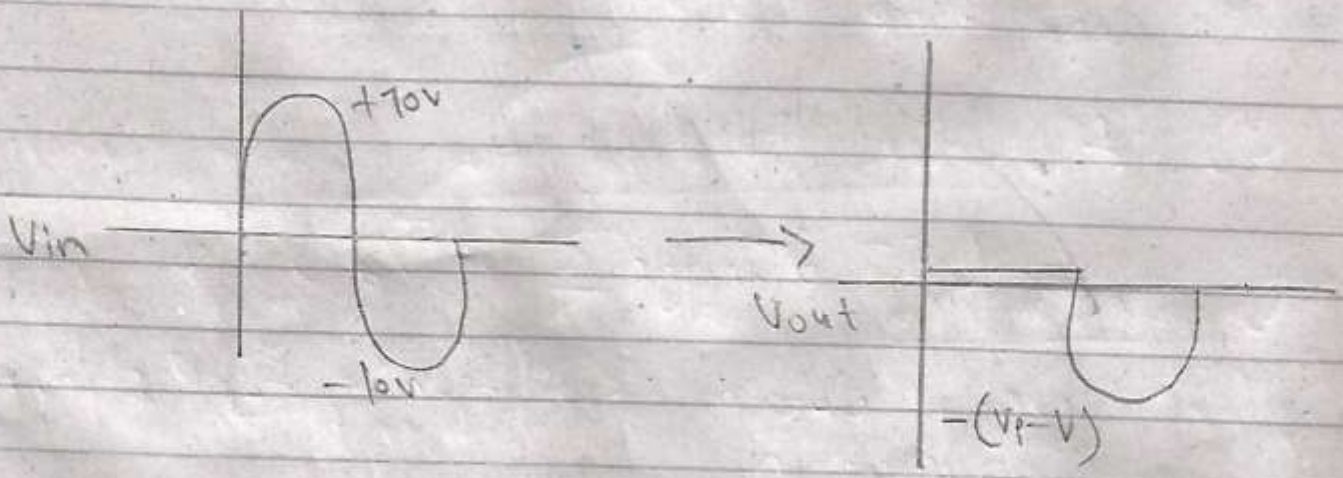
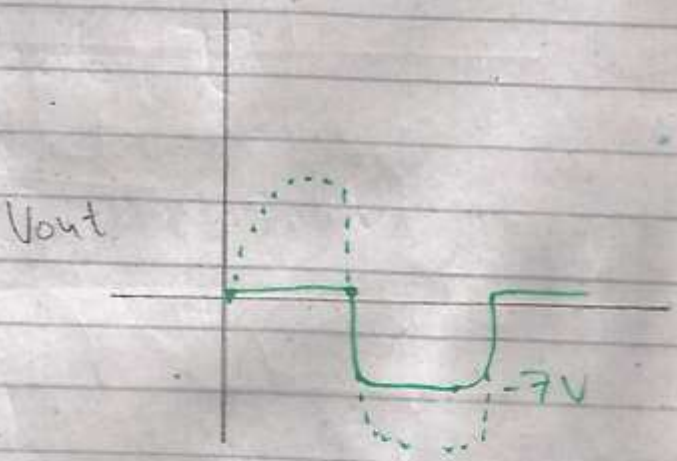


Figure-3



output wave form





Q4.	Determine the output voltage waveform for the circuit given in Figure 4. Assume the RC time constant is much greater than the period of the input.	Marks 02 CLO 02

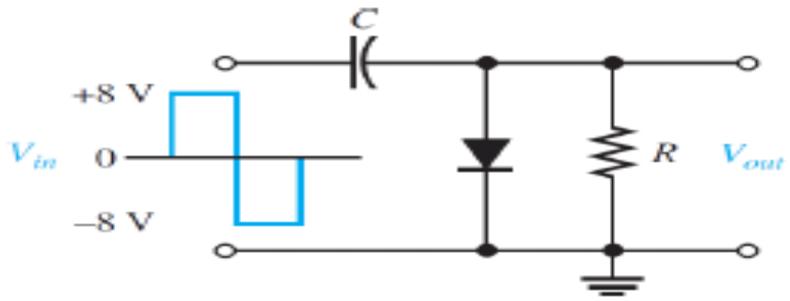


Figure-4

-8V

Assume the RC time Constant Much greater than Period of input time

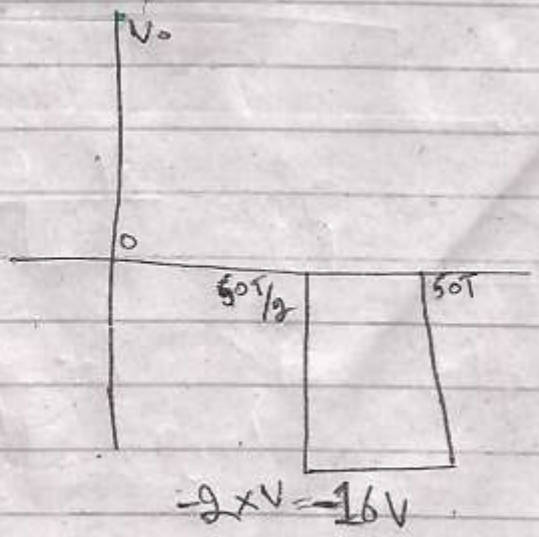
if we take

(5T discharge $\geq$ 5o T/2) so

we obtain condition for clamping operation

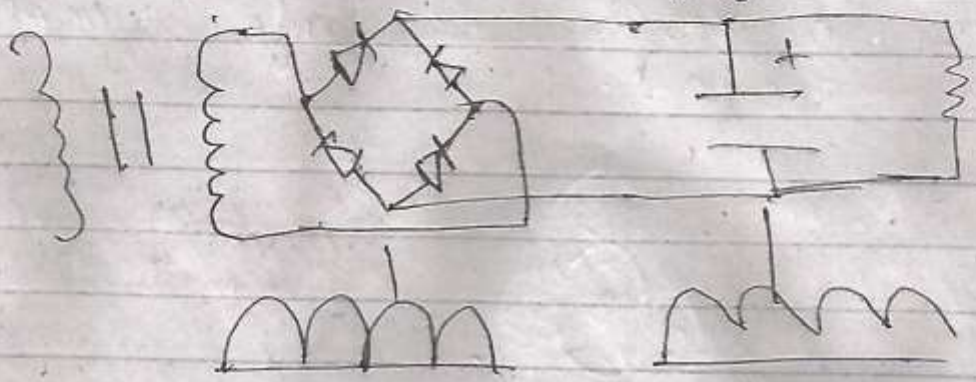
T discharge $\geq$ 5T

$V_o = V_i - V \pm V_{DCON}$



Q5.	Answer the following questions.	Marks 14
	a) What is a Power Supply Filter? Discuss its operation with help of a circuit diagram. (3) b) How are n-type and p-type semiconductors formed? (2) c) What is a diode limiter? What is the difference between a positive limiter and a negative limiter? (3)	CLO 01
	d) What component in a clamping circuit effectively acts as a battery? (1) e) When a 60 Hz sinusoidal voltage is applied to the input of a half-wave rectifier, what is the output frequency? (1) f) If the load resistance connected to a filtered power supply is decreased, what happens to the ripple voltage? (1) g) Discuss how diode limiters and diode clampers differ in terms of their function. (3)	

a) Power Supply filter



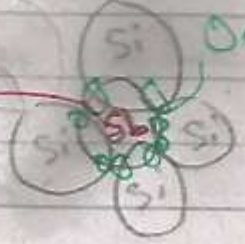
filter act as a reducing ripple
As a capacitor charging & discharging.

b) N-type and P-type semiconductor formation

N-type Semiconductor:- when a small amount of Pentavalent impurity is added to a Pure silicon-crystal it forms N-type semiconductor.

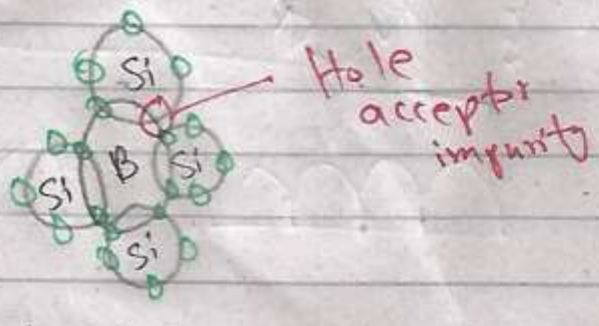
The addition of Pentavalent impurity produces a large no of free $\bar{e}$ to the host crystal.

Pentavalent impurity



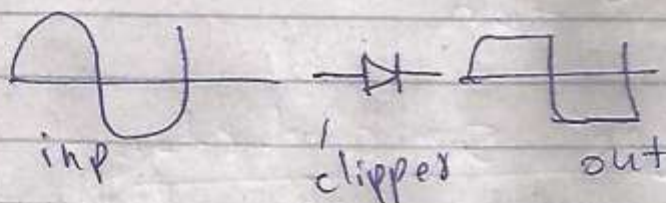
P-type semiconductor:-

It is formed by adding trivalent impurity to a pure semiconductor in a small amount and as a result a large number of holes created.

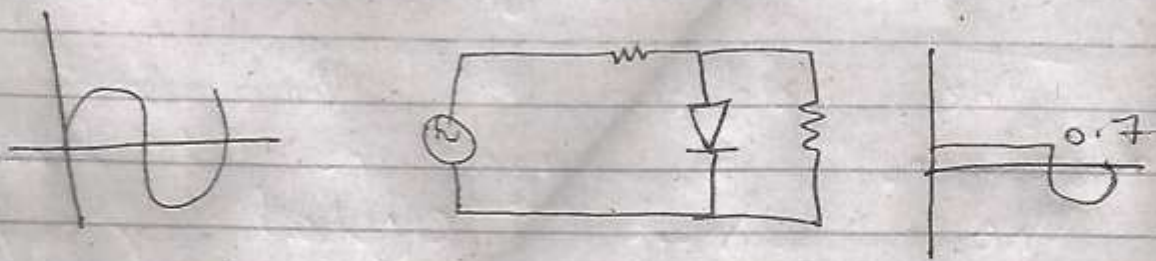


c) Diode limiter & +ive & -ive limiter:-

Diode Limiter:- It is a type of Circuit which is used to clip off A.C signal at a different desired level

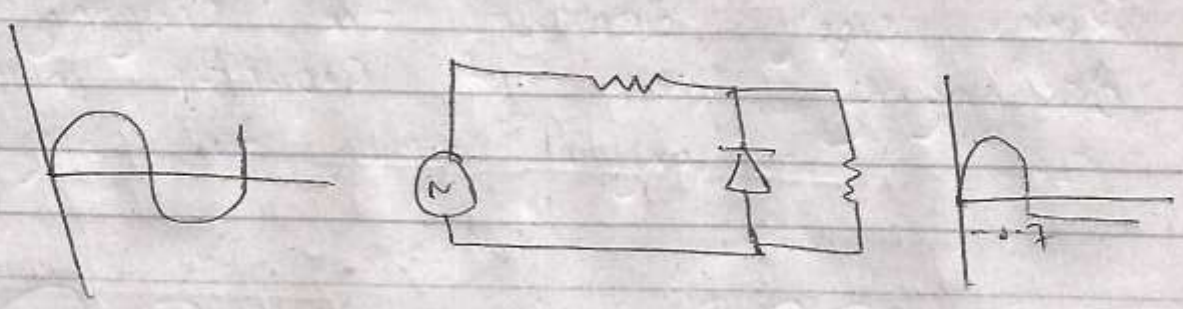


Positive Diode limiter:-



used to clip off +ive half cycle.

-ive Diode limiter:-



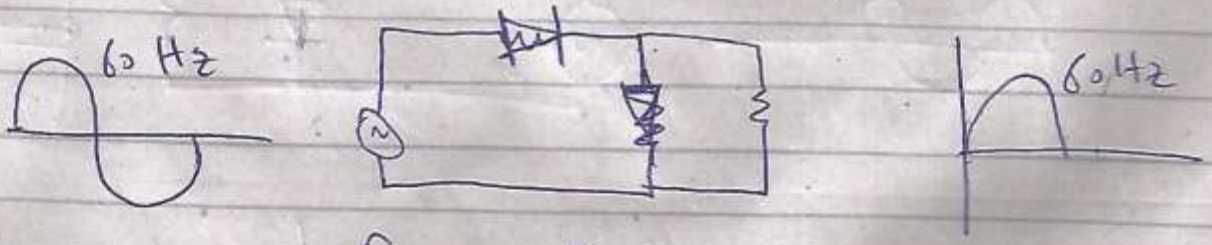
used to clipoff -ive half cycle.

d)

Capacitor effectively act as a Battery in clamping Circuit.

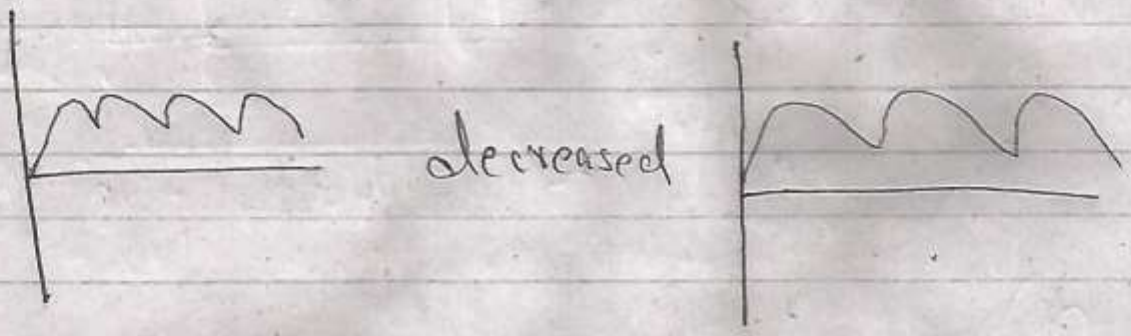
e)

The output frequency of half wave rectifier is equal as input i.e it means 60 Hz at input Produce 60 Hz at output



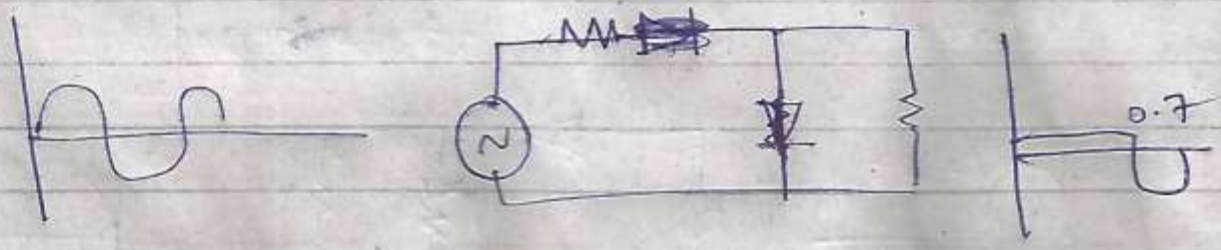
$f_{in} = f_{out}$

f) If the load resistance to filtered power supply decreases the charging and discharging time of capacitor increases so takes longer time to charge & discharge



g) Difference between diode limiter & damper:-

Diode Limiter:- It is a type of circuit which is used to clip-off a sinusioclal wave form at a desired level

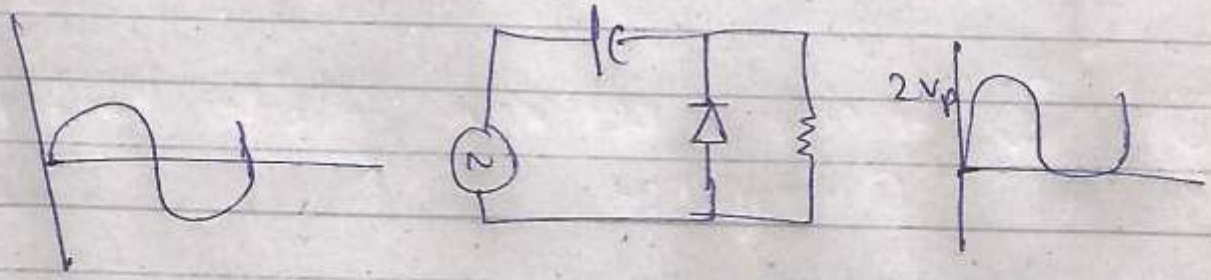


it is widely used as a voltage regulator.

Diode clamper:-

It is a type of Circuit which is used to add DC -offset to a tive or -ive half cycle of a sinusiodal wave form

It clamp the whole signal to a desired level.



it is used as a voltage doubler or Multiplier.