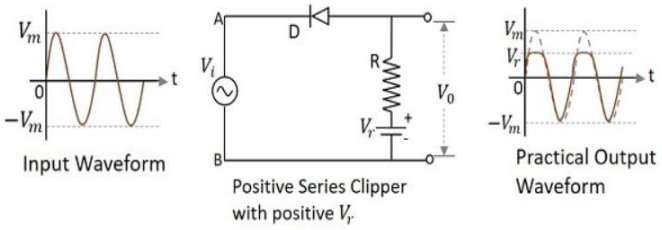
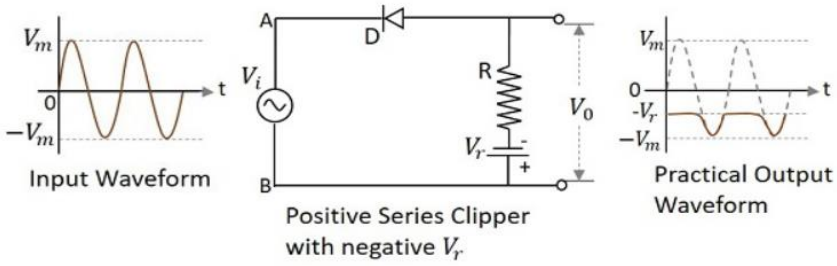
Basic Electrical and Electronic Circuits (BEC) COURSE (23EC1203)

Revision Q&A –CO3
Long Answers

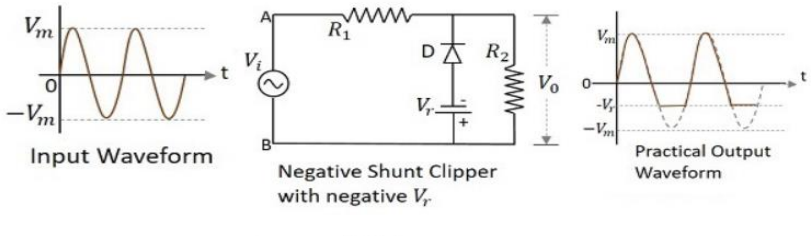
1. Explain the operation of positive and negative Biased clippers with circuit diagram
   A.) Positive Series Clipper with Positive Biased (Vr)

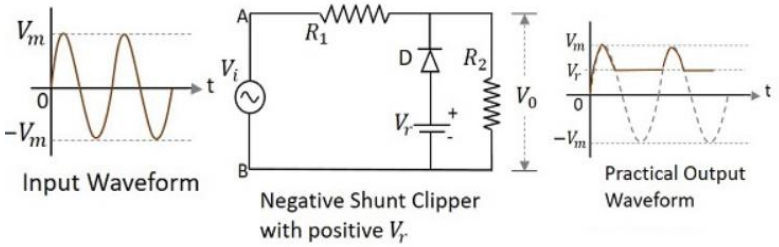


Positive Series Clipper with Negative Biased (Vr)



->Negative Shunt Clipper with Positive biased(Vr) and Negative Biased (Vr)



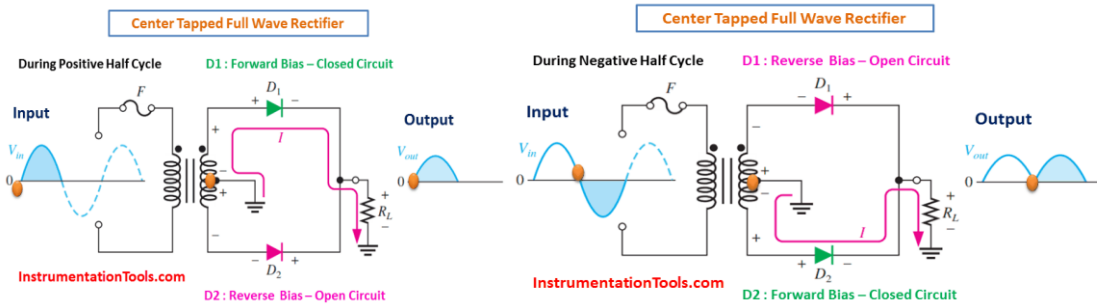


2. Explain the operation of full wave rectifier with neat circuit and output wave form

10. Explain the operation of full wave center tapped rectifier with neat circuit and output wave form

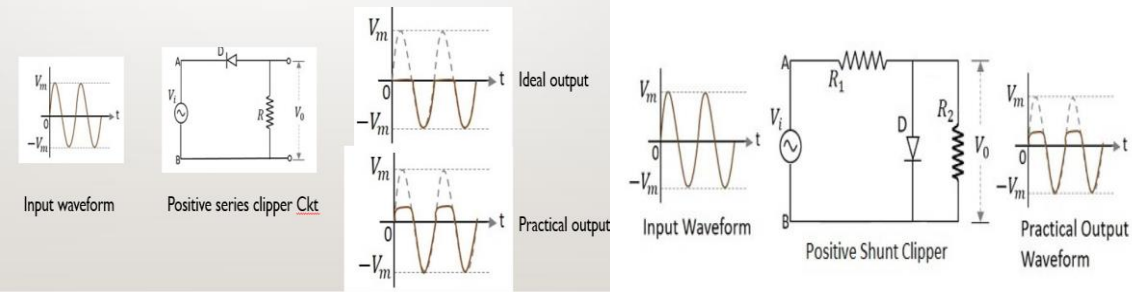
A.) **Full Wave Center-tapped Rectifier**

Operation + Circuit diagram



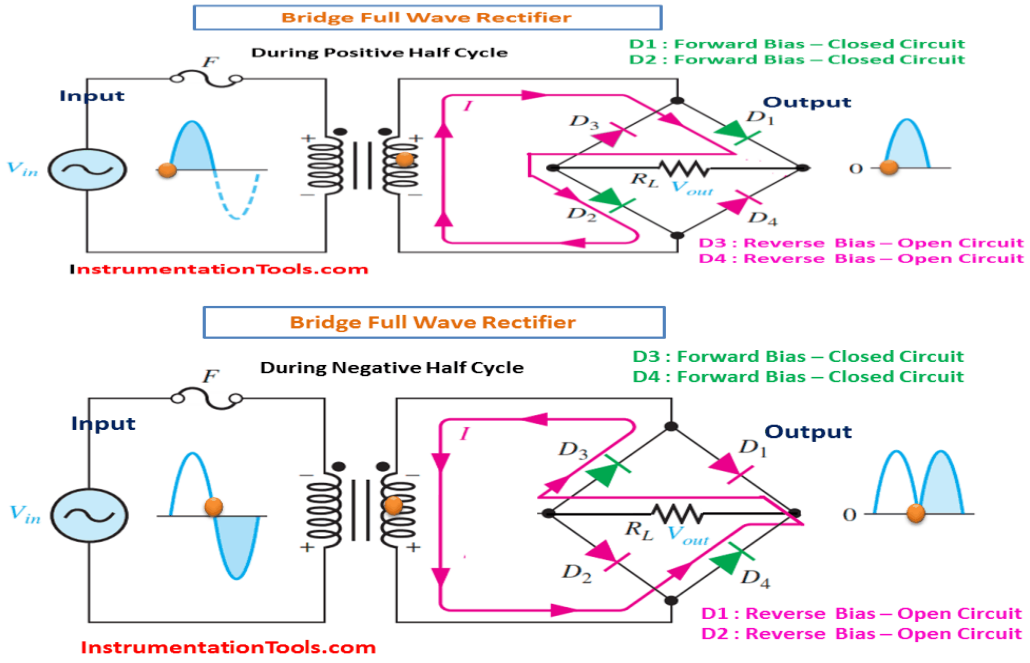
6. Explain the operation of positive series and shunt clipper with circuit diagram

19. Explain the operation of shunt clippers with waveforms

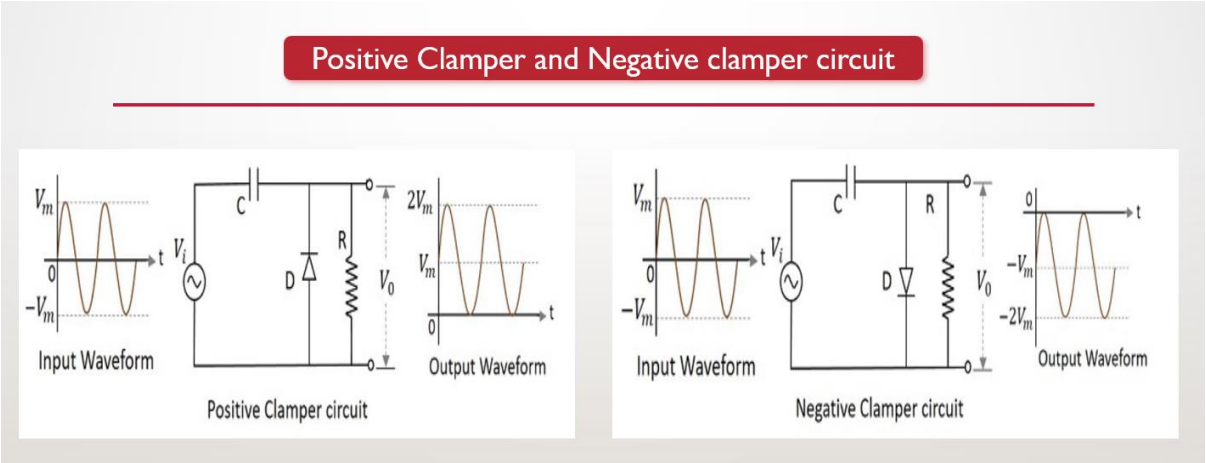


5. Explain the operation of full wave bridge rectifier with neat circuit and output wave form

Explain the rectifier operation with respect to diode conduction



11. Explain about positive and negative clampers with input and output waveforms
17. Explain about clamper circuits ?
27. Explain the operation of negative biased clippers



25. Compare all rectifiers with respect to ripple factor, efficiency, TUF , PIV values.

Parameter	HWR	FWR(CT)	FWR(Bridge)
I_{dc}	I_m/π	$2I_m/\pi$	$2I_m/\pi$
V_{dc}	V_m/π	$2V_m/\pi$	$2V_m/\pi$
I_{rms}	$I_m/2$	$I_m/\sqrt{2}$	$I_m/\sqrt{2}$
V_{rms}	$V_m/2$	$V_m/\sqrt{2}$	$V_m/\sqrt{2}$
f=Form factor	1.57	1.11	1.11
r = Ripple factor	1.21	0.48	0.48
P_{dc}	$(I_m/\pi)^2 R_L$	$(2I_m/\pi)^2 R_L$	$(2I_m/\pi)^2 R_L$
P_{ac}	$I_m^2 (R_s+R_f+R_L)/4$	$I_m^2 (R_s+R_f+R_L)/2$	$I_m^2(R_s+R_f+R_L)/2$
Efficiency	$4/\pi^2 = 40.6\%$	$8/\pi^2 = 81.2\%$	$8/\pi^2 = 81.2\%$
PIV	$2V_m$	V_m	V_m
TUF	0.287	(0.574+0.812)/2	0.812
%Reg	$(R_s+R_f)/R_L$	$(R_s/2+R_f)/R_L$	$(R_s+2R_f)/R_L$
No. of Diodes	1	2	4
frequency	f	2f	2f

26. Draw the configuration of NPN transistor and explain its operation

A.) Depending on the biasing conditions like forward or reverse, transistors have three major modes of operation namely cutoff, active and saturation regions.

Cutoff Mode as in circuit 1:

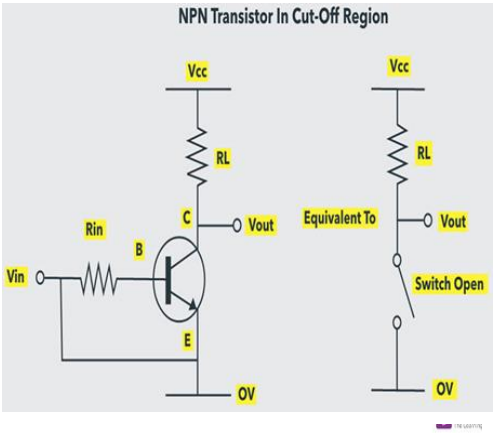
- In this mode, both collector base junction and emitter base junction are reverse biased. As both the PN Junctions are reverse biased,
- there is almost no current flow except small leakage currents BJT in this mode is switched OFF and is essentially an open circuit.
- Cutoff Region is primarily used in switching and digital logic circuits.

Saturation mode as in circuit 2:

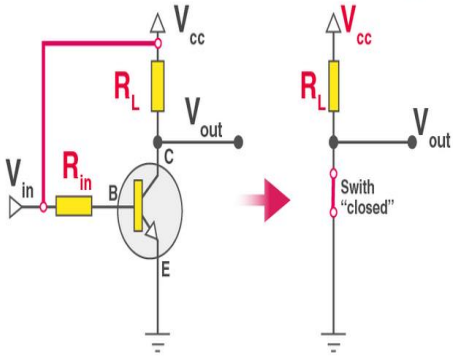
- the highest base current is applied, leading to the overall collector current.(Ic(max)= Ic (sat).

- causes the average collector-emitter voltage to fall and the leakage surface as small as possible [V_0 =Vcesat =Vce(min)=0]
- the maximum current that flows across this transistor.
- Transistor is triggered, and acts as closed switch.Thus DEVICE is "Fully ON" and is represented in below circuits.

Cutoff Mode as in circuit 1:



Saturation mode as in circuit 2:



28. Derive the expression for ripple factor, % efficiency , for fullwave rectifier and draw the output waveforms