

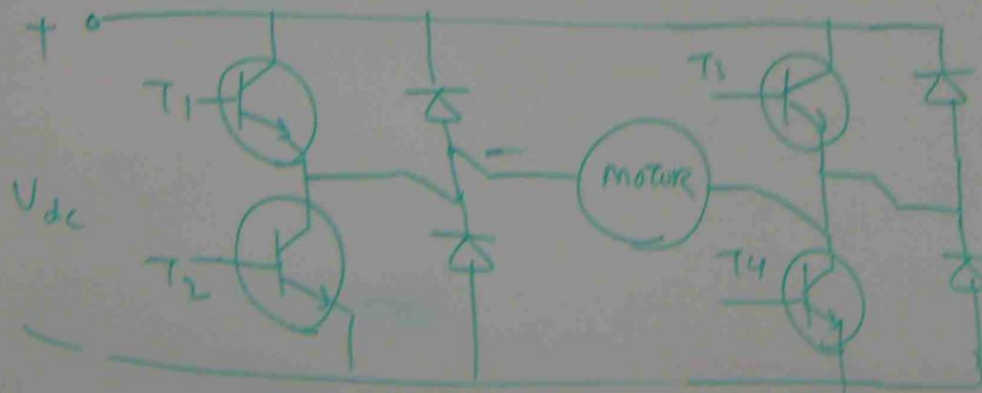
1 $\phi$  AND 3 $\phi$  RECTIFIER CIRCUITS ARE UTILIZED TO CONVERT 1 $\phi$  OR 3 $\phi$  AC IN TO DC VOLTAGE.

CAPACITOR FILTER IS APPLIED TO GET THE SMOOTH WAVE

## CHOPPER CIRCUITS

CHOPPER CIRCUIT WITH 4 TRANSISTOR (DC SYSTEM)

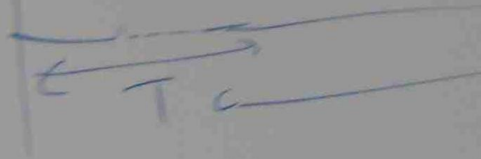
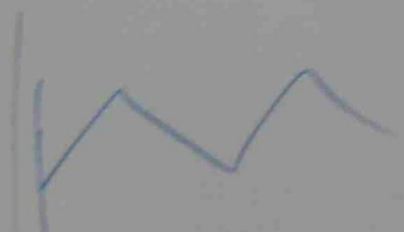
INPUT DC IS CONVERTED TO VARIABLE FREQUENCY VOLTAGE



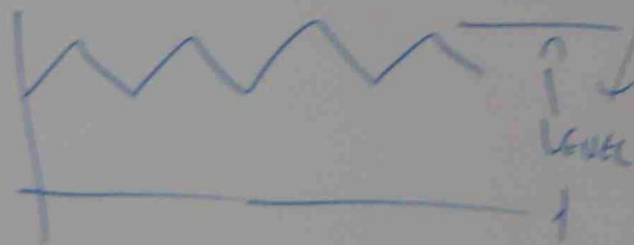
T<sub>1</sub> & T<sub>3</sub>  
ARE  
OPPOSITE



CHOPPER IS UTILIZED TO CONVERT THE  
CONSTANT DC TO VARIABLE DC

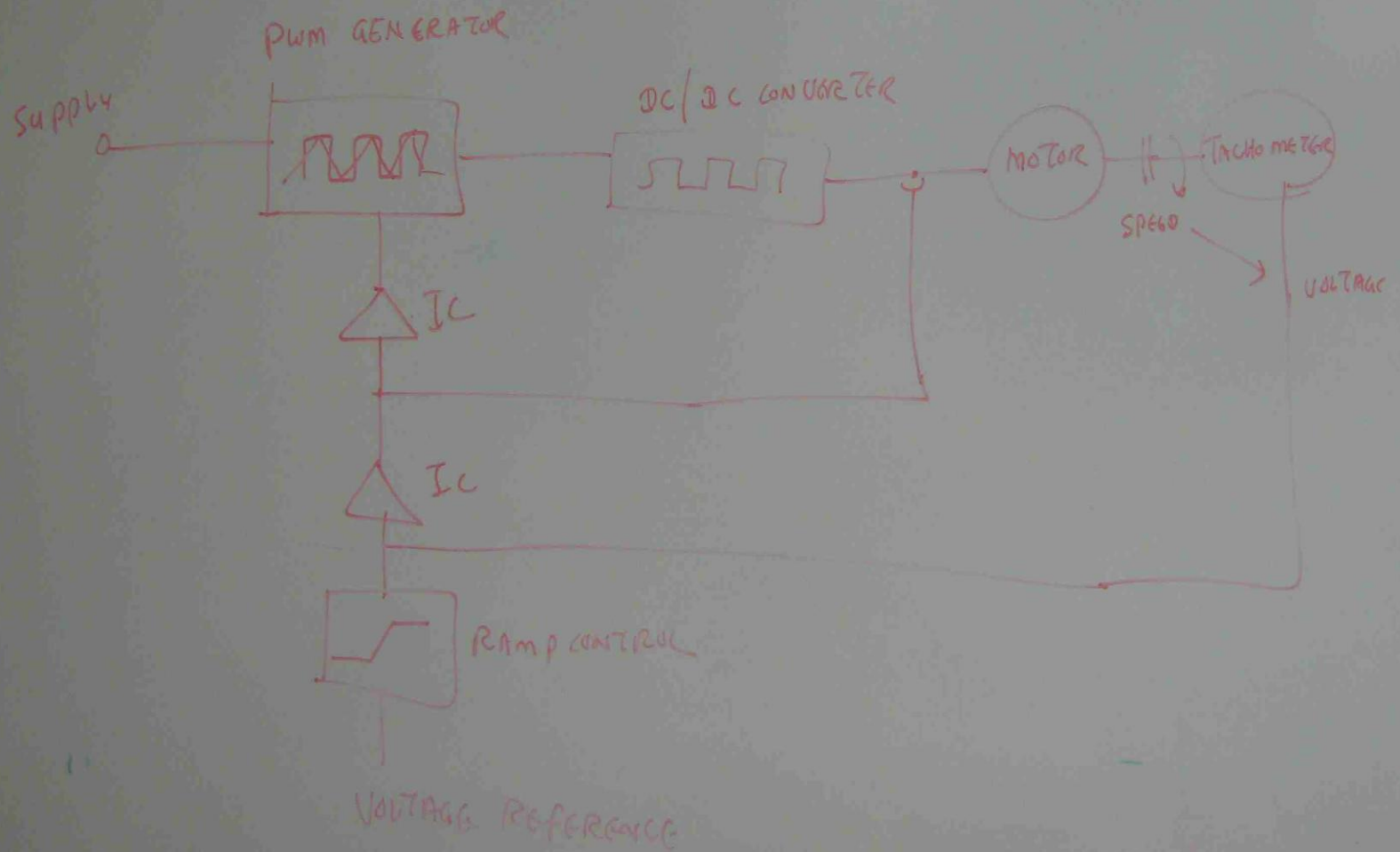


DEPENDS ON  
SWITCHING  
RATES OF  
 $T_1$   $T_2$   $T_3$   $T_4$



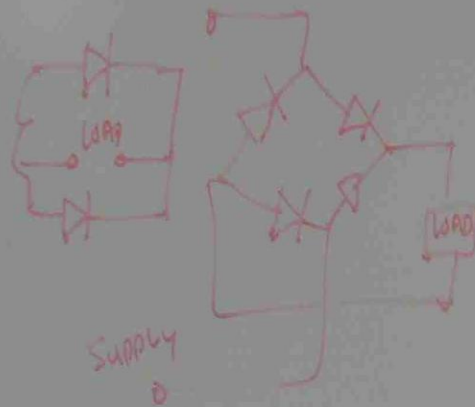
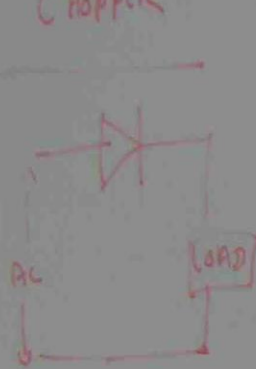
PULSATING DC

# TYPICAL TRANSISTOR DC DRIVE CONTROL LOOP

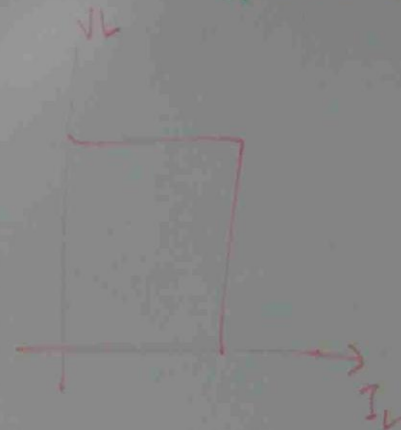


## CLASS A CHOPPER

RECTIFIER

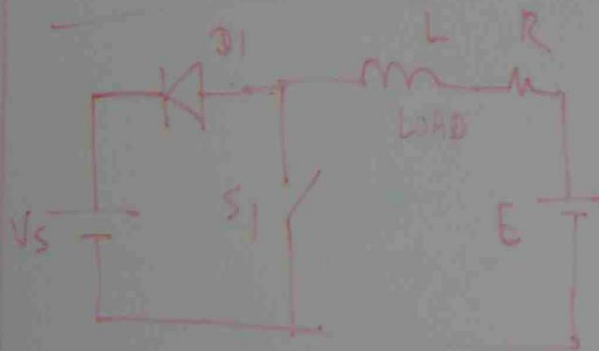


OPERATION CHART

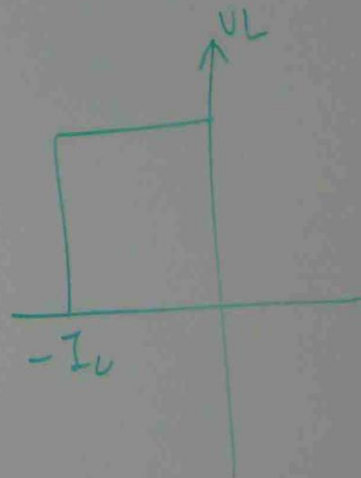
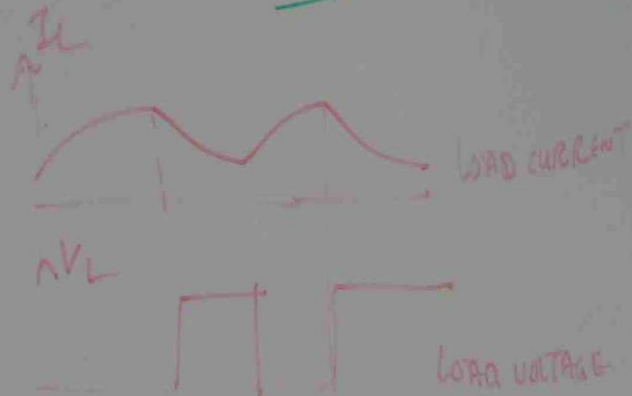


WAVE FORM

## CLASS B CHOPPER

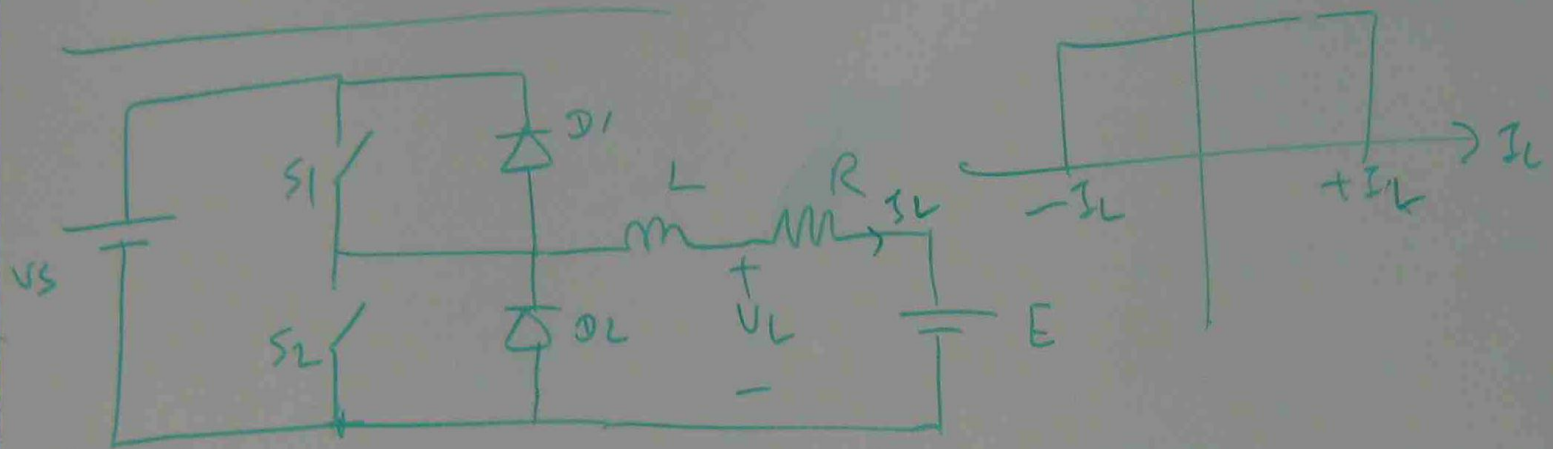


INVERTER

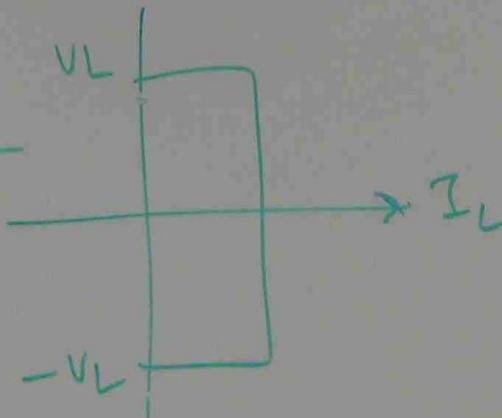




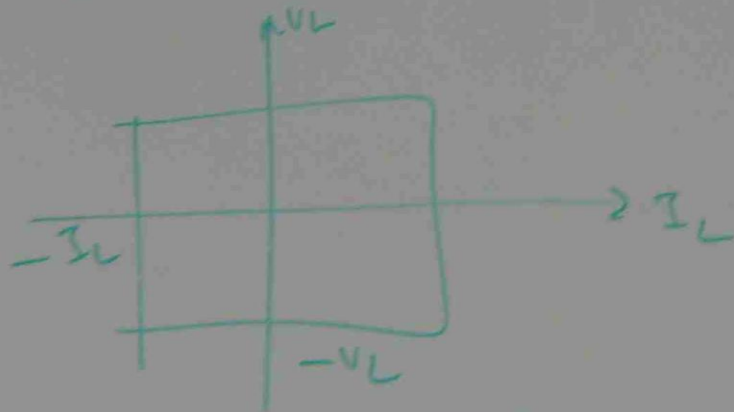
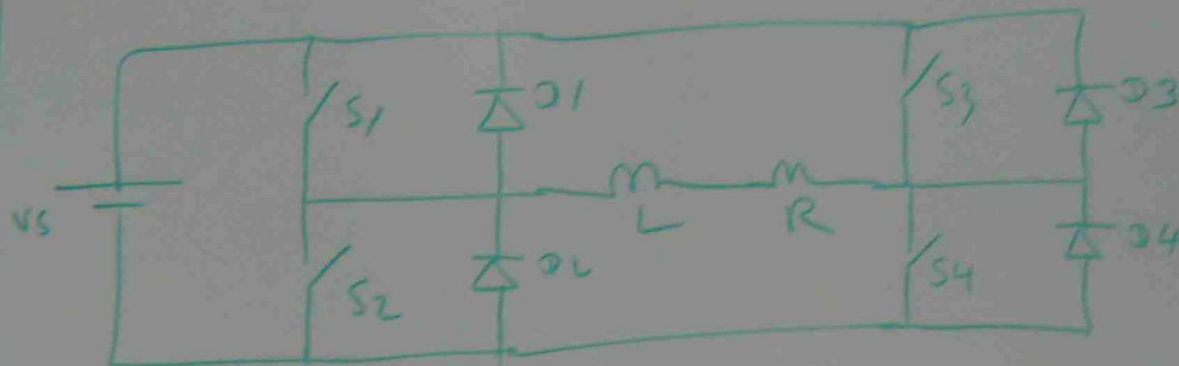
## CLASS (C) CHOPPER



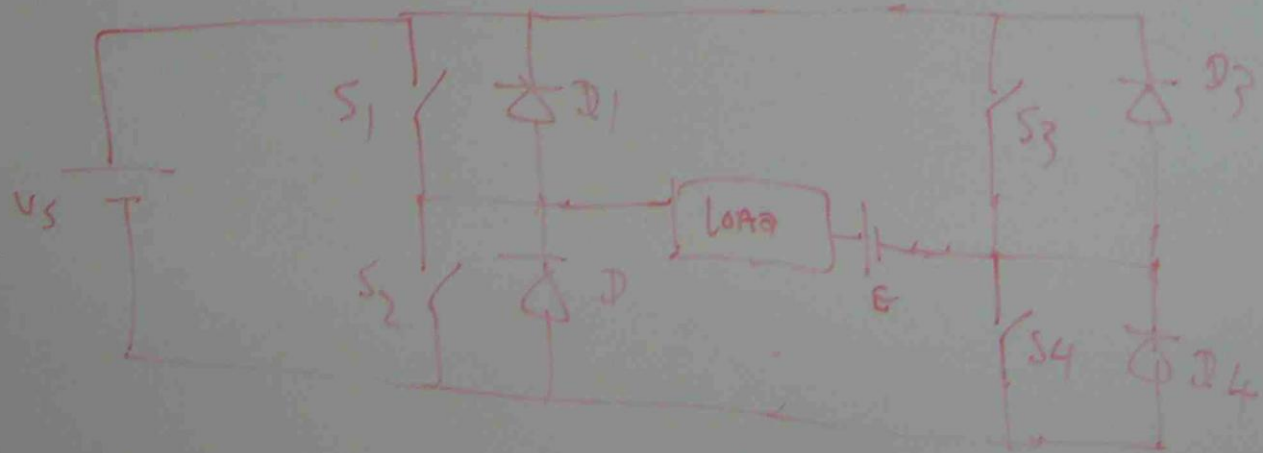
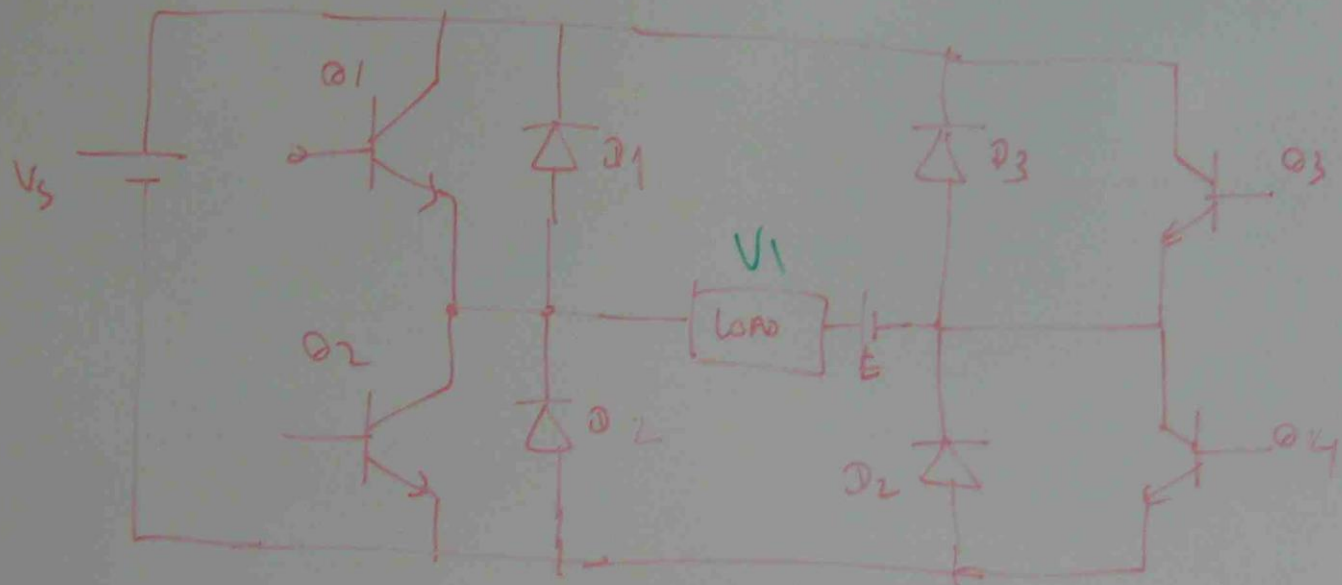
## CLASS D



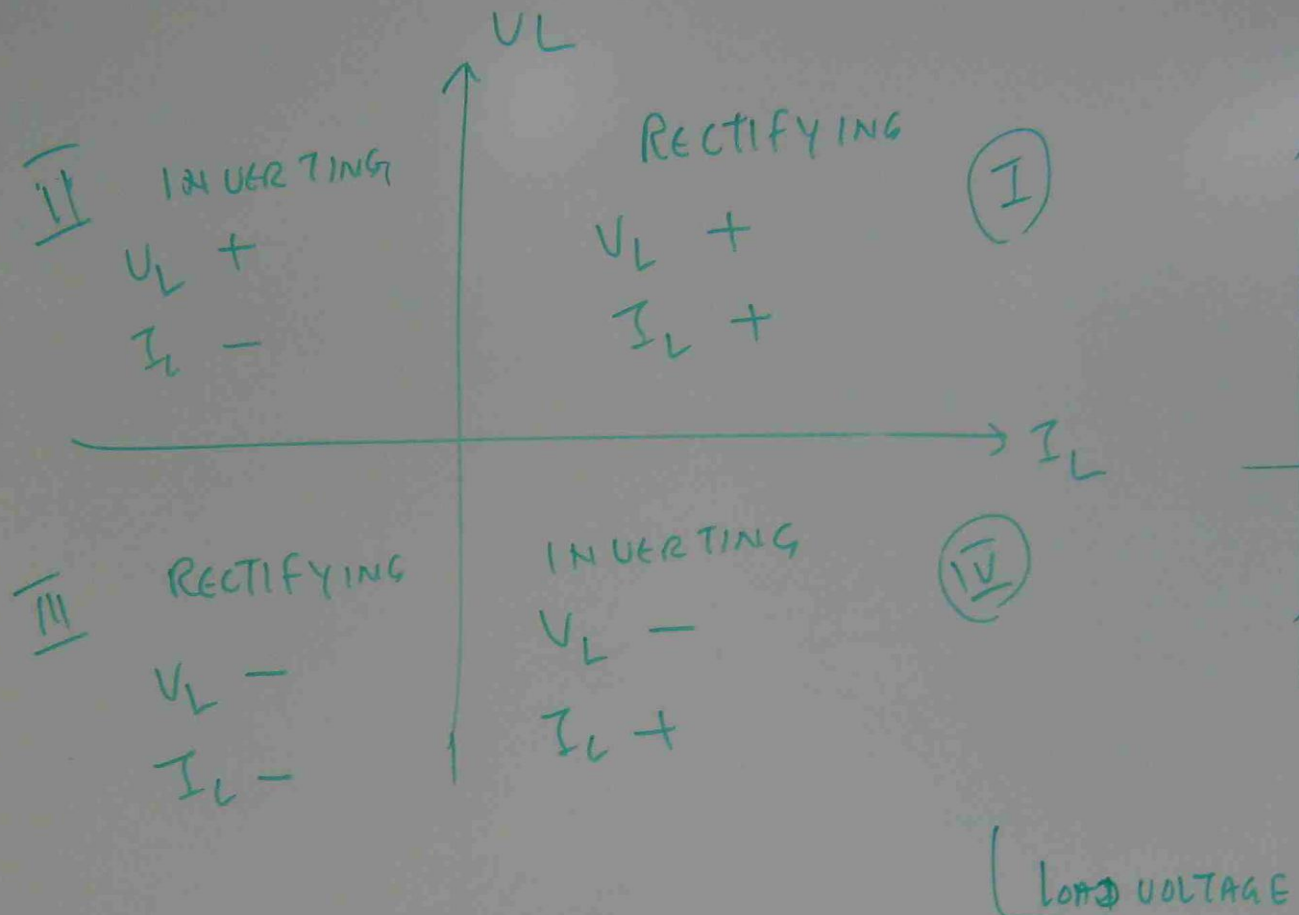
## CLASS (E) CHOPPER



# 4 QUADRANTS OPERATION OF CLASS (E) CHOPPER

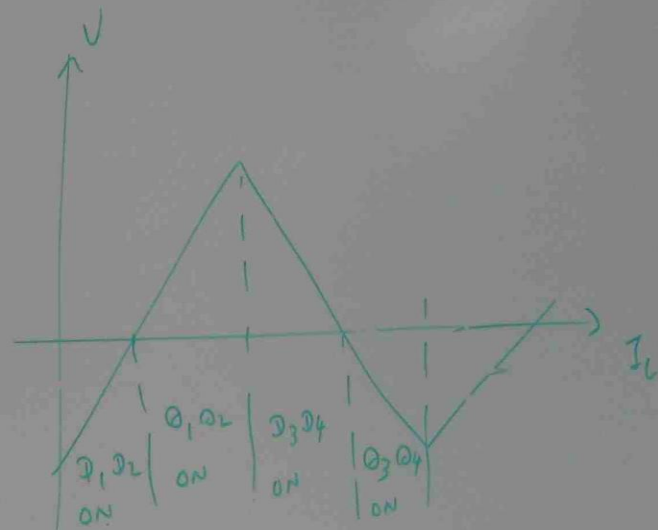
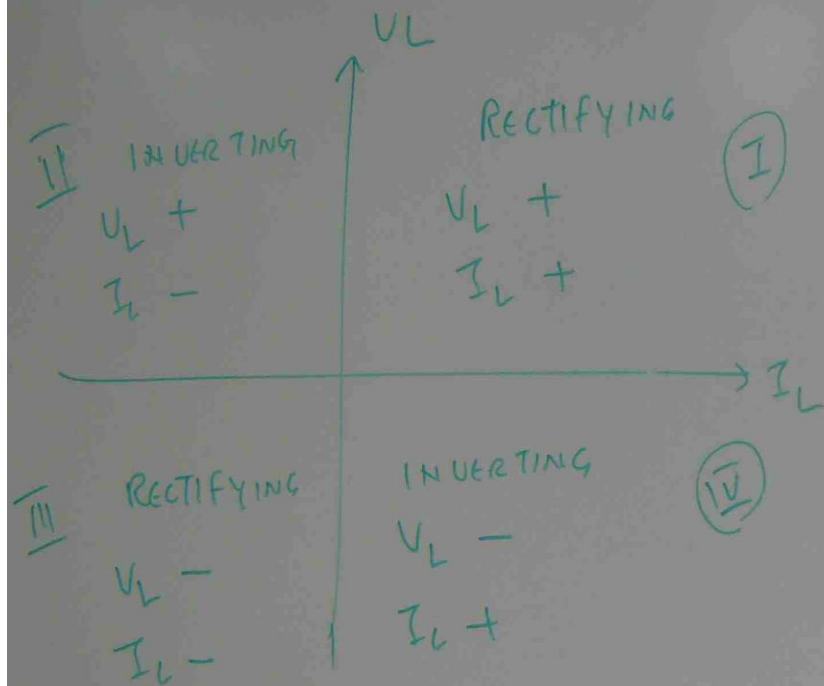






4 QUADRANTS CLASS (E) CHOPPER PROVIDES BOTH RECTIFYING AND INVERTING FUNCTIONS.

IT RECTIFIES THE VOLTAGE AS WELL AS INVERTS THE CURRENT AND VOLTAGE OF THE LOAD.

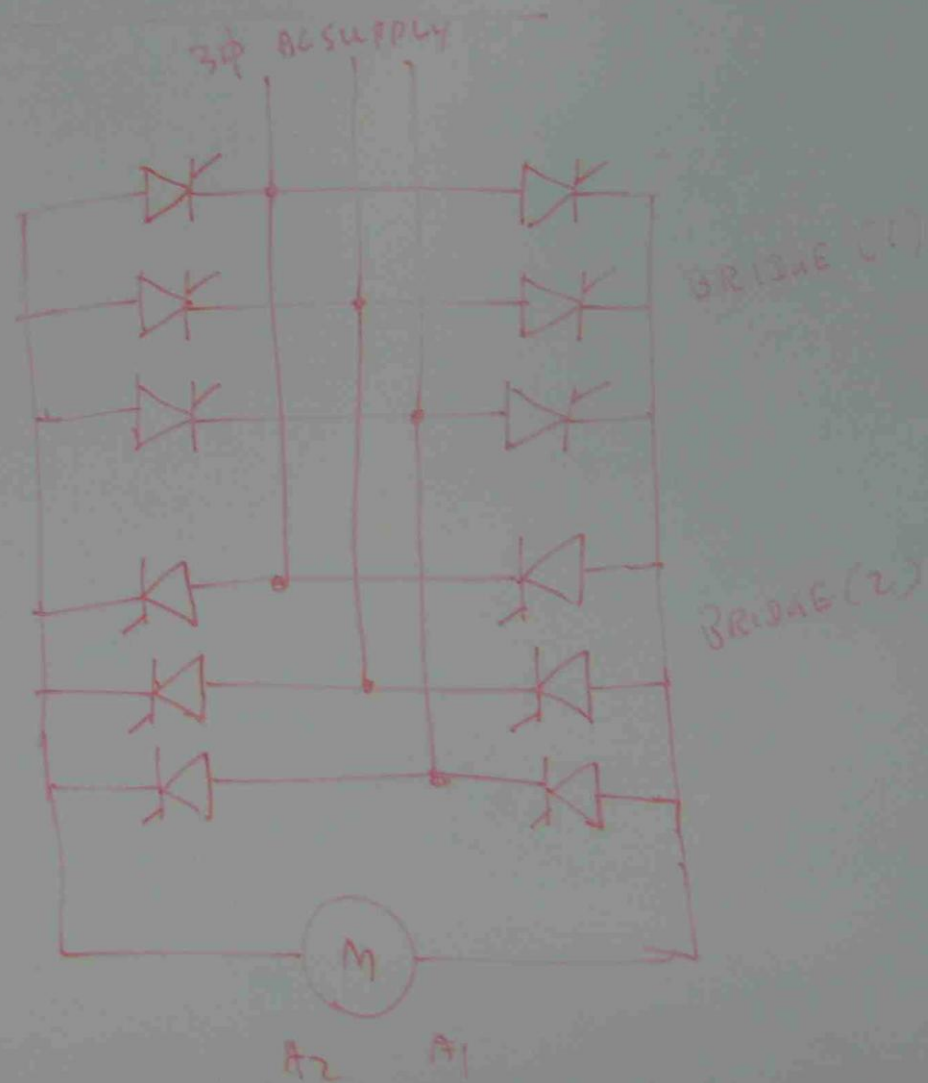


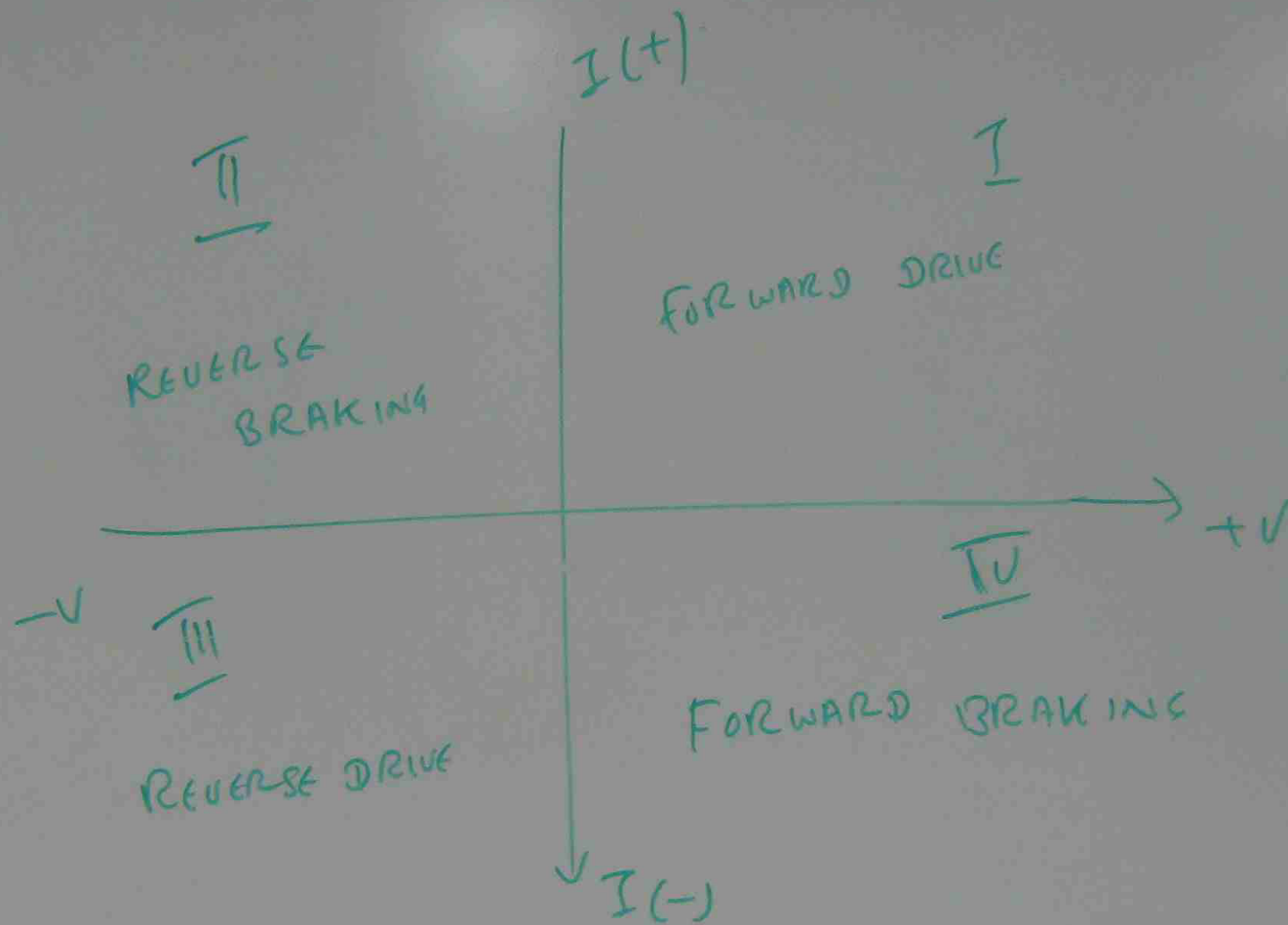
$$\text{LOAD VOLTAGE} = V_1 = \frac{4 V_s}{\sqrt{2} \pi} \approx 0.9 V_s$$

4 QUADRANTS CLASS (E) CHOPPER PROVIDES BOTH RECTIFYING AND INVERTING FUNCTIONS. IT RECTIFIES THE VOLTAGE AS WELL AS INVERTS THE CURRENT AND VOLTAGE OF THE LOAD.

THE VOLTAGE SUPPLIED TO THE LOAD IS SHOWN IN ABOVE DIAGRAM AND ITS MAGNITUDE IS  $0.9 V_s$ .

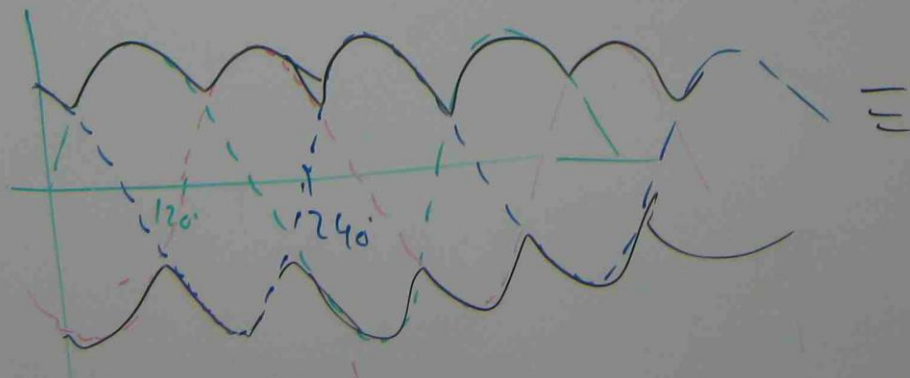
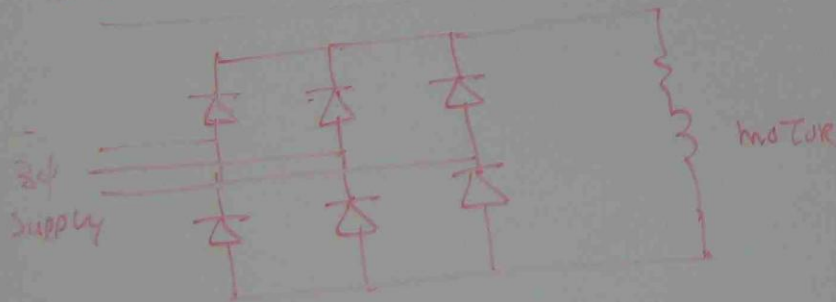
#### 4 QUADRANT THYRISTOR DRIVE



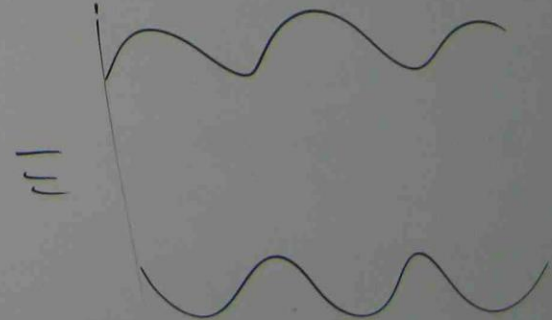


4 QUADRANT SCR OPERATION UTILIZES TWO 3 $\phi$  SCR BRIDGES  
TO ROTATE THE MOTOR IN FORWARD AND REVERSE DIRECTIONS  
AND TO BRAKE THE FORWARD AND REVERSE DIRECTIONS OF ROTATION.

3 $\phi$  RECTIFIER BRIDGE AND VOLTAGE CURRENT WAVE FORMS

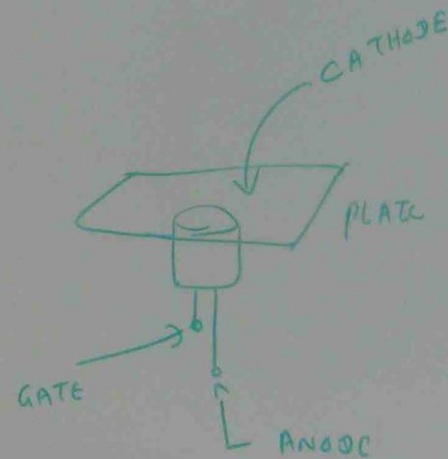
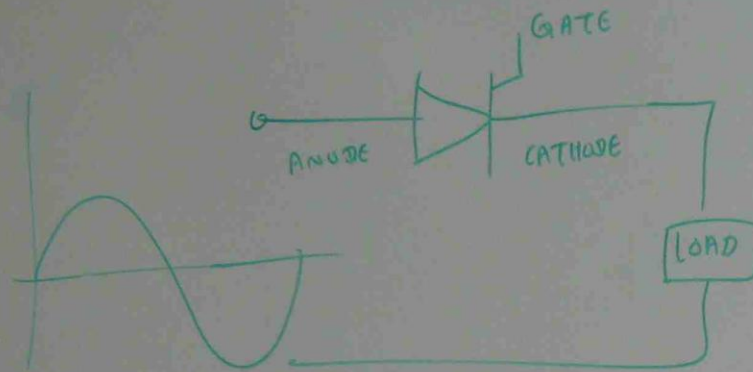


VOLTAGE

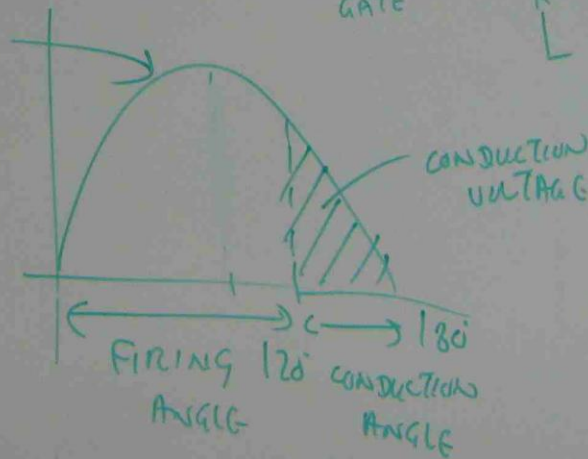




# OPERATION PRINCIPLE OF POWER SCR (SILICON CONTROLLED RECTIFIER)



SUPPLY HALF CYCLE VOLTAGE



DEPENDS  
ON CONDUCTION

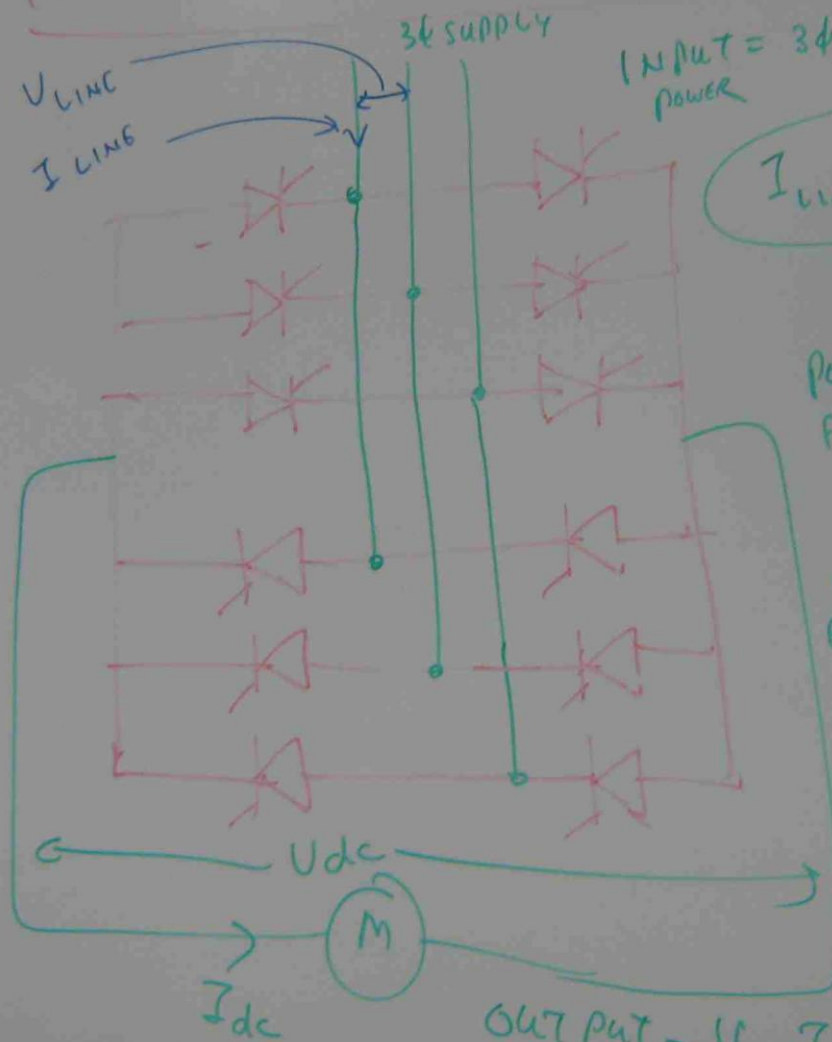


SMALL CONDUCTION

LARGER CONDUCTION

DEPENDING ON VALUE OF FIRING ANGLE, SCR MAKES THE  
CONDUCTION

# POWER AND POWER FACTOR OF SCR DRIVE SYSTEM



INPUT = 3 $\phi$  POWER =  $\sqrt{3} V_{LINE} I_{LINE}$

$I_{LINE} = 0.833 I_{dc}$

POWER FACTOR =  $\frac{W}{VA}$

POWER FACTOR =  $\frac{V_{dc} I_{dc}}{\sqrt{3} V_{LINE} I_{LINE}}$

PF =  $\frac{V_{dc} I_{dc}}{\sqrt{3} V_{LINE} \times 0.833 I_{dc}}$

PF =  $\frac{0.7 V_{dc}}{V_{LINE}}$

OUTPUT POWER =  $V_{dc} I_{dc}$

## POWER FACTOR CORRECTION OF SCR DRIVE MOTORS

