



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Re-accredited by NAAC with 'A+' Grade

Approved by AICTE, New Delhi, Recognized by UGC & Affiliated by Anna University, Chennai
Coimbatore-641035

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

19EET301 / POWER ELECTRONICS AND DRIVES

III YEAR / V SEMESTER

UNIT – IV : Part B - DC DRIVES



**CHOPPER FED DC
DRIVE – 1Q, 2Q, 4Q
OPERATION**



TOPIC OUTLINE

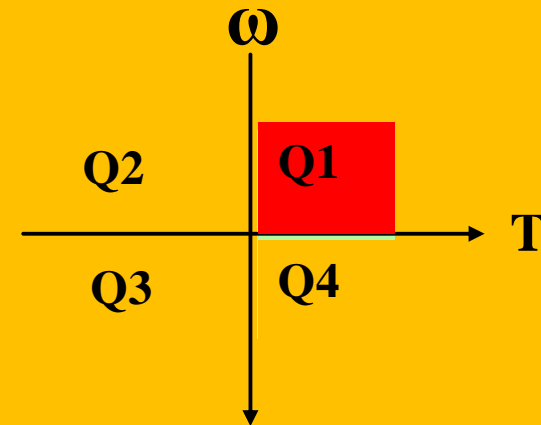
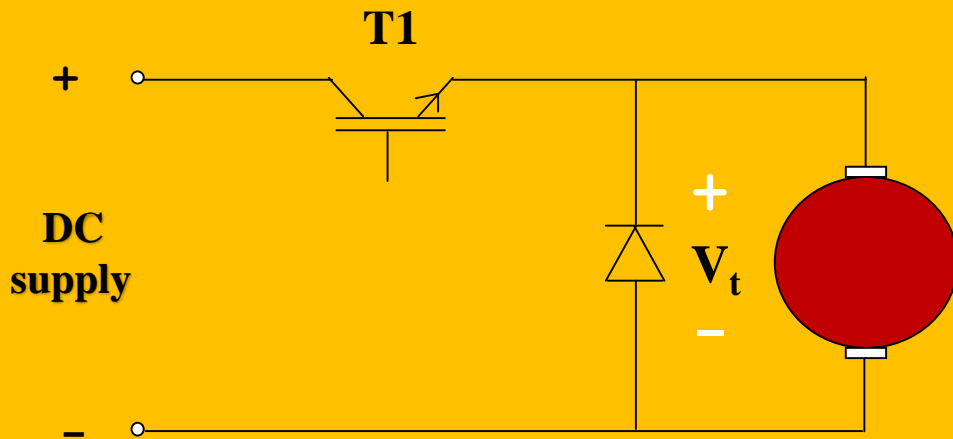
What we'll discuss?



- Chopper 1 Q drive
- Chopper 2 Q drive
- Chopper 4 Q drive
- Advantages of Chopper drive



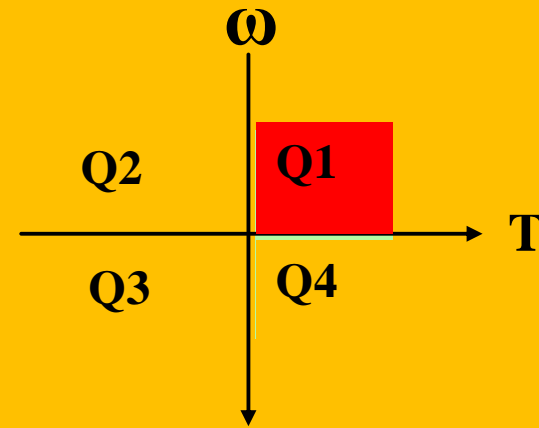
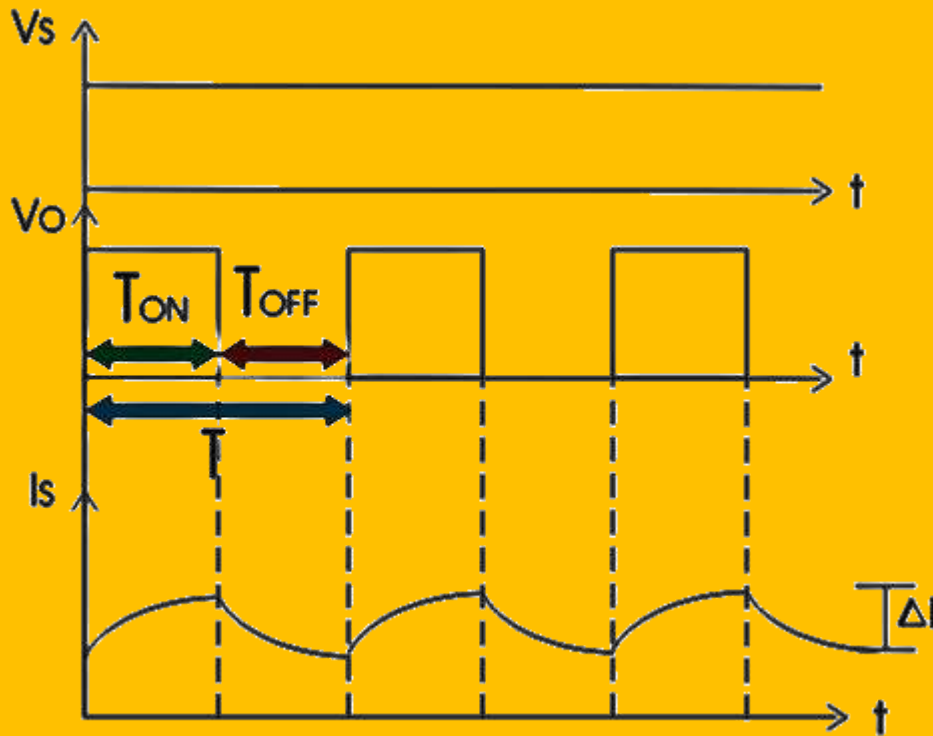
1 Q – CHOPPER FED DC DRIVE



MOTORING MODE & QUADRANT OF OPERATION



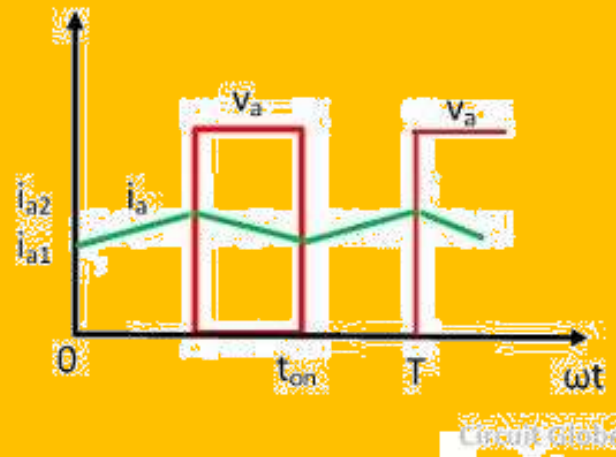
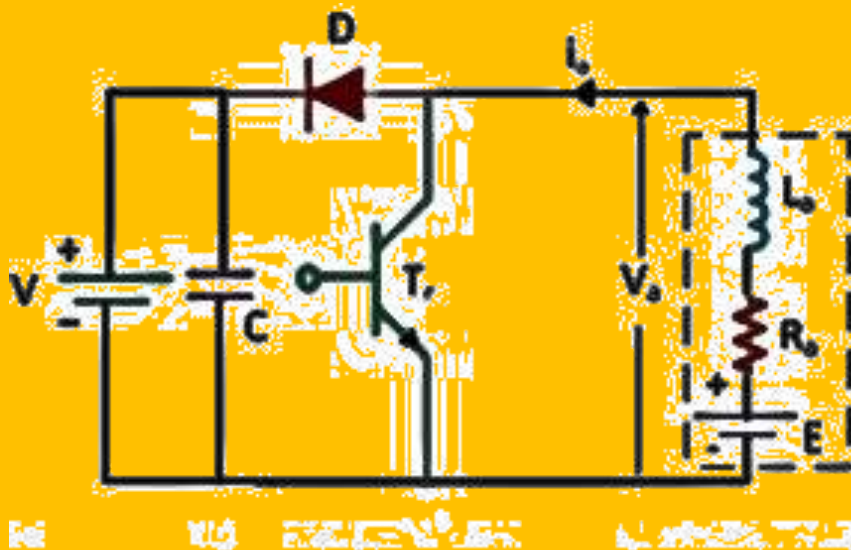
1 Q – CHOPPER FED DC DRIVE



WAVEFORM & QUADRANT OF OPERATION



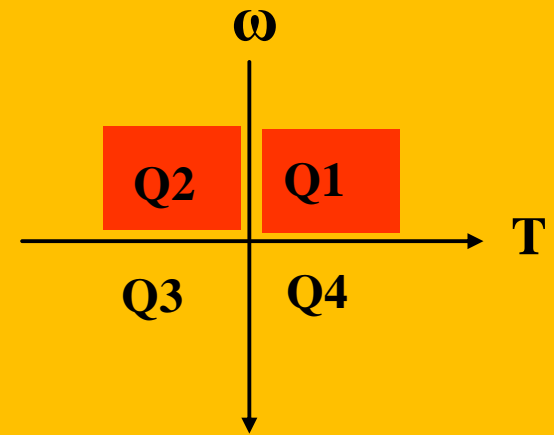
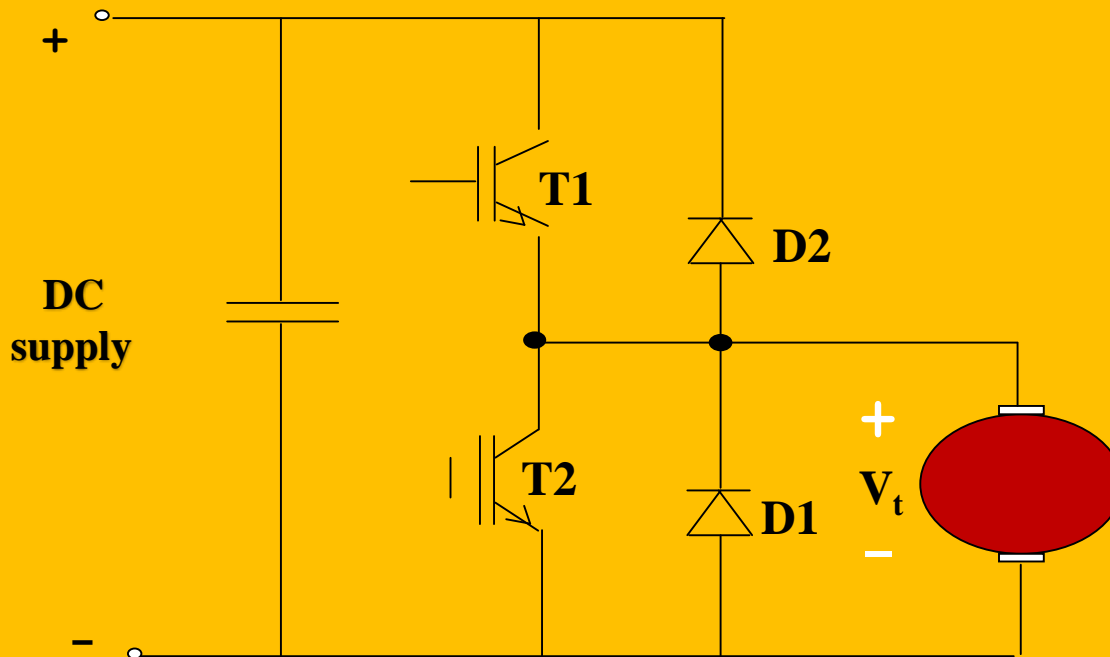
1 Q – CHOPPER FED DC DRIVE



REGENERATIVE BRAKING MODE & WAVEFORM OF OPERATION



2 Q – CHOPPER FED DC DRIVE



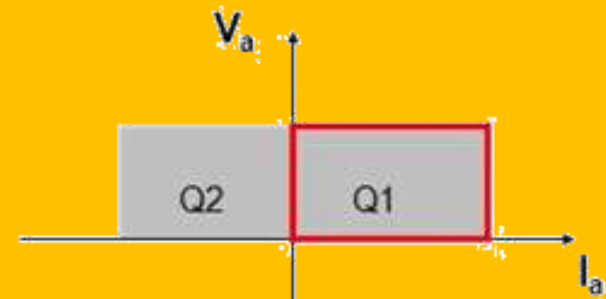
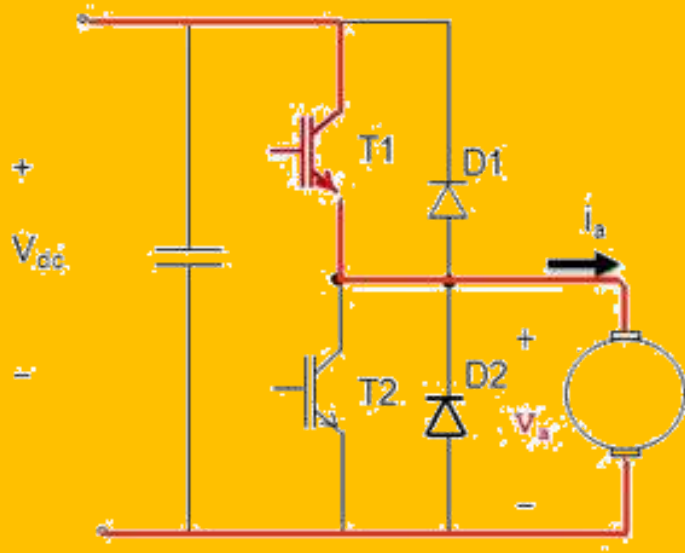
Q1 → T1 and D1

Q2 → D2 and T2

CIRCUIT DIAGRAM & QUADRANT OF OPERATION



2 Q – CHOPPER FED DC DRIVE

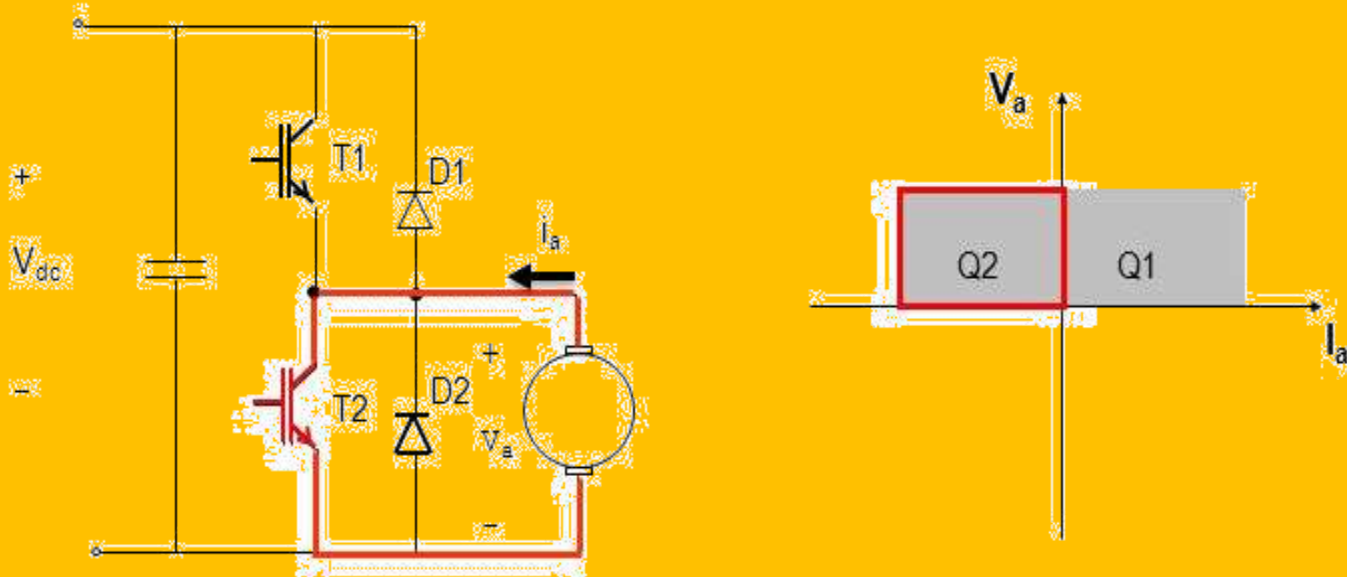


T1 conducts $\rightarrow v_a = V_{dc}$

CIRCUIT DIAGRAM & QUADRANT OF OPERATION



2 Q – CHOPPER FED DC DRIVE

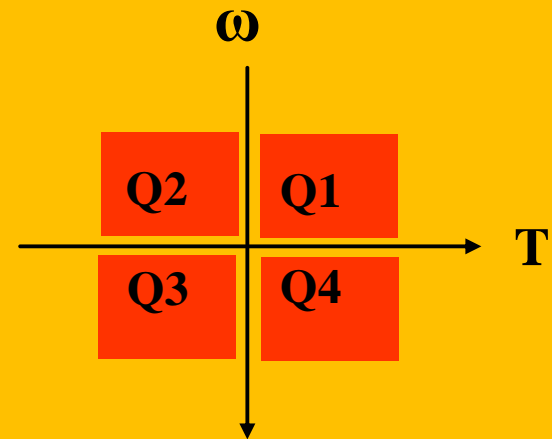
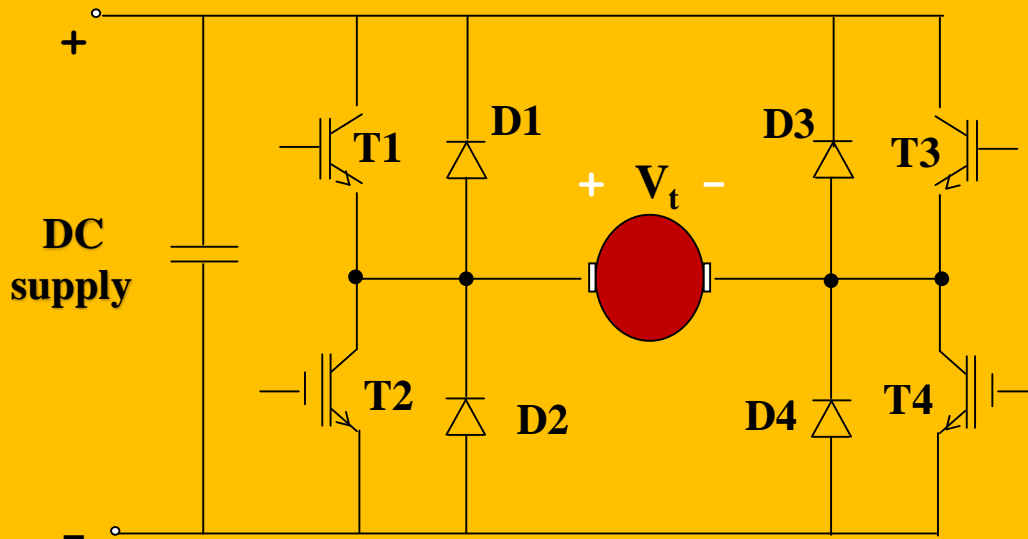


T2 conducts $\rightarrow v_a = 0$

CIRCUIT DIAGRAM & QUADRANT OF OPERATION



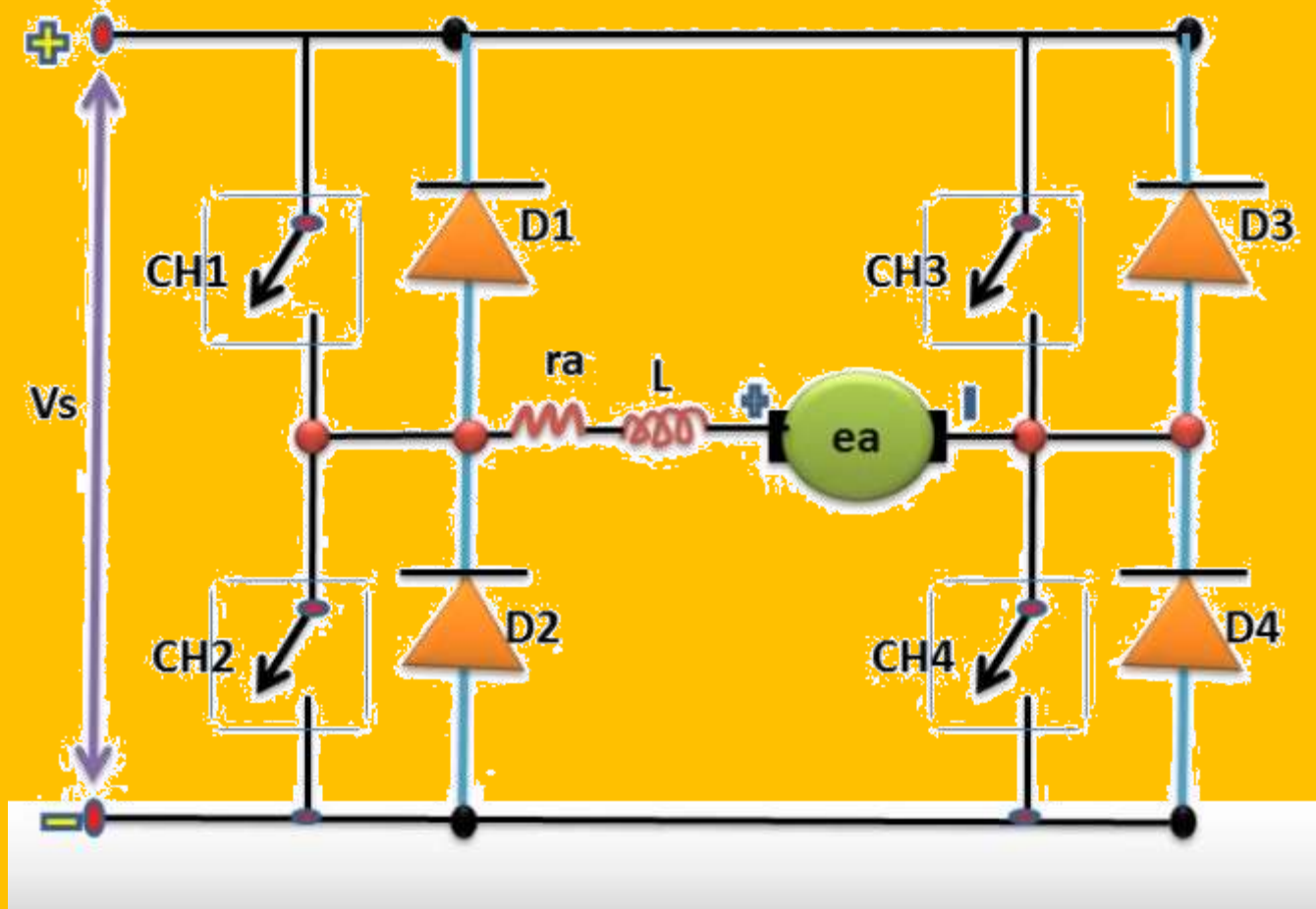
4 Q – CHOPPER FED DC DRIVE



CIRCUIT DIAGRAM & QUADRANT OF OPERATION



4 Q – CHOPPER FED DC DRIVE

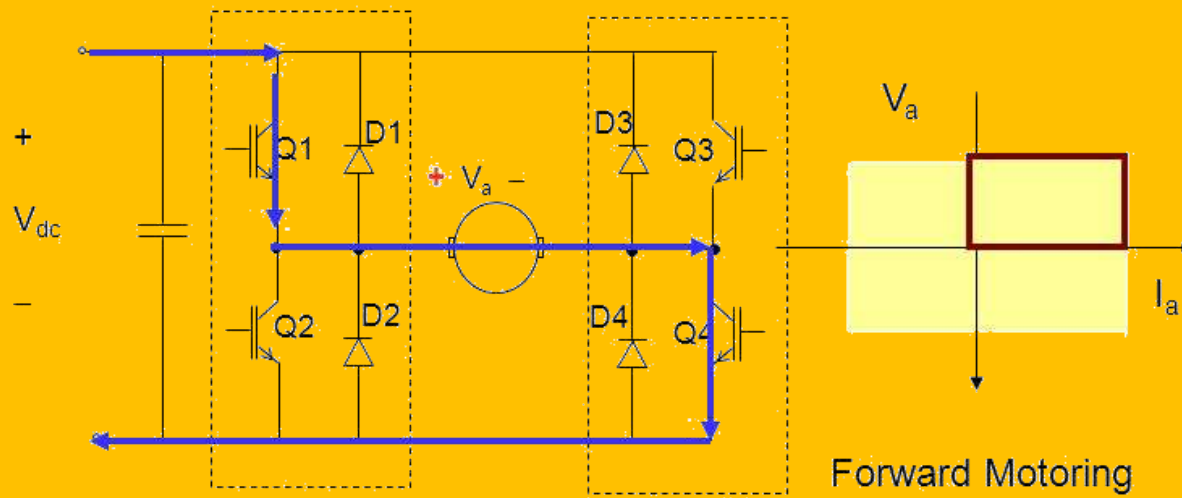


CIRCUIT DIAGRAM



4 Q – CHOPPER FED DC DRIVE

Chopper fed DC drive
Four-quadrant Chopper



Q1 & Q4 is ON

Current Flow : $V_{dc} \rightarrow Q_1 \rightarrow \text{Motor} \rightarrow Q_4 \rightarrow V_{dc}$

Current I_a & V_a are positive

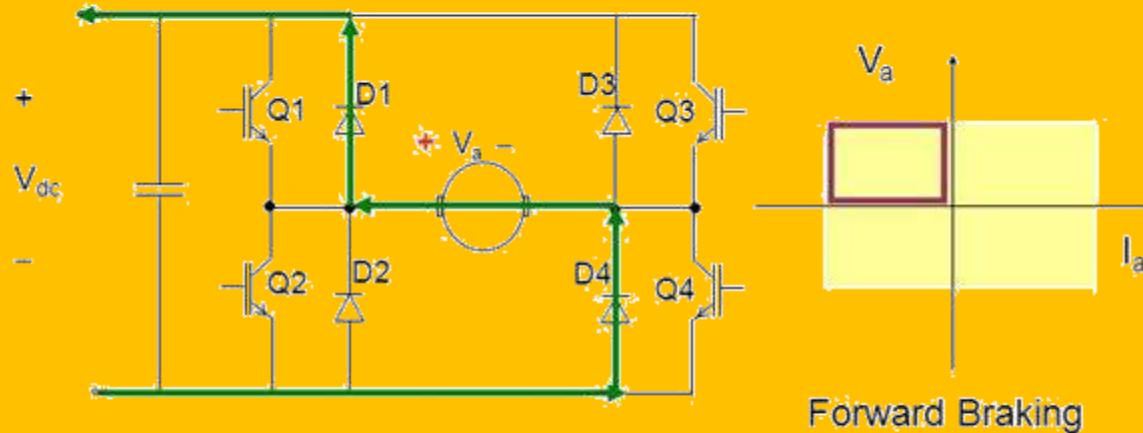
Operates in First Quadrant





4 Q – CHOPPER FED DC DRIVE

Chopper fed DC drive
Four-quadrant Chopper



Q2 is OFF. Diode D1 is FB

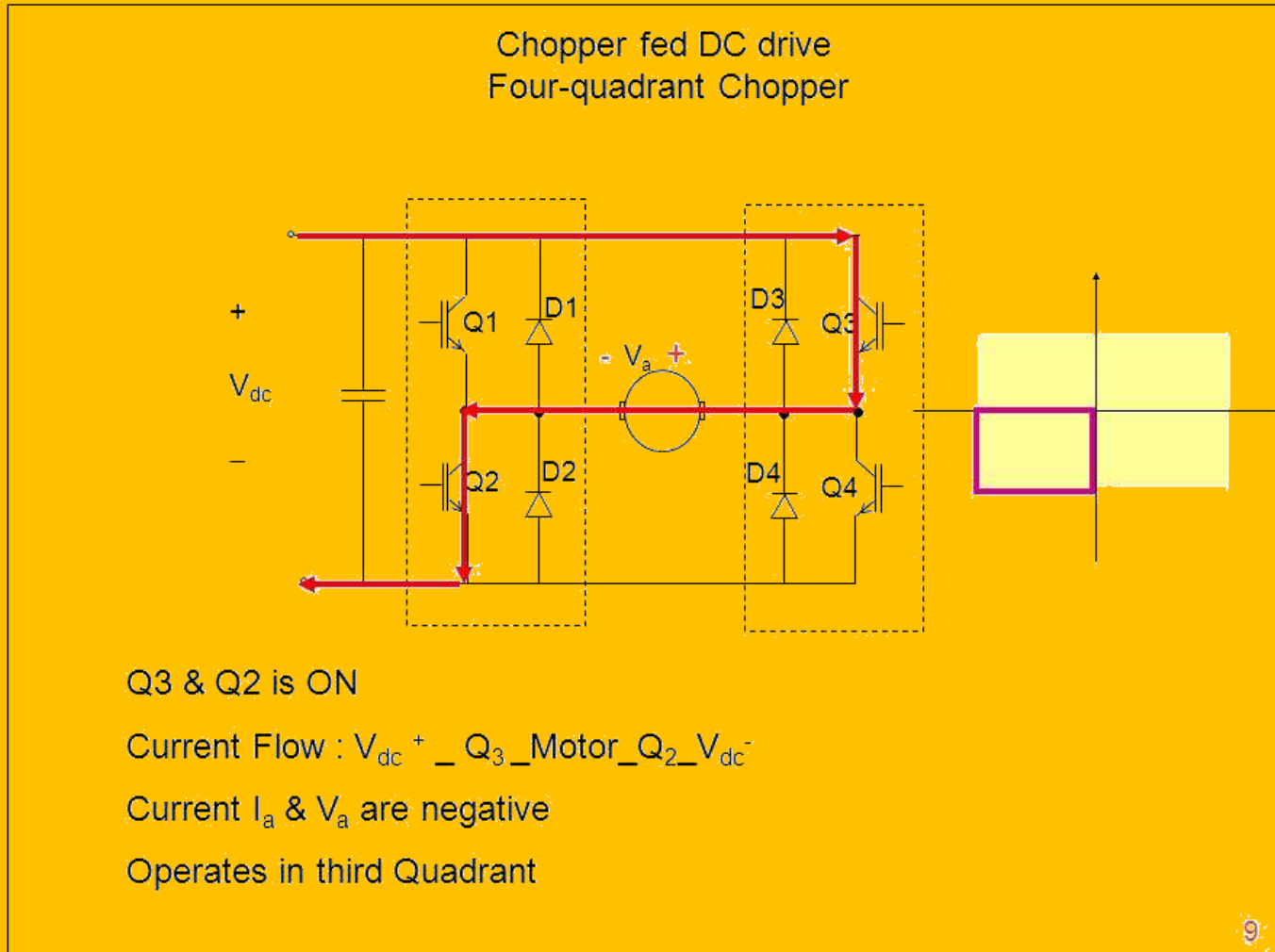
Current flows through V_a^+ D₁ - V_{dc} - D₄ - V_a^-

Current I_a is negative & V_a is positive.

Operates in second quadrant.



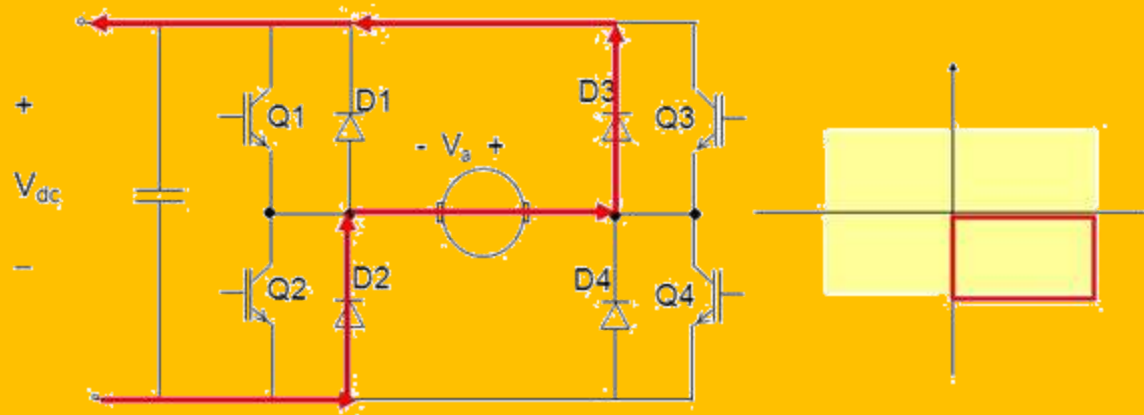
4 Q – CHOPPER FED DC DRIVE





4 Q – CHOPPER FED DC DRIVE

Chopper fed DC drive
Four-quadrant Chopper



Q4 IS Turned Off,

D3 is FB

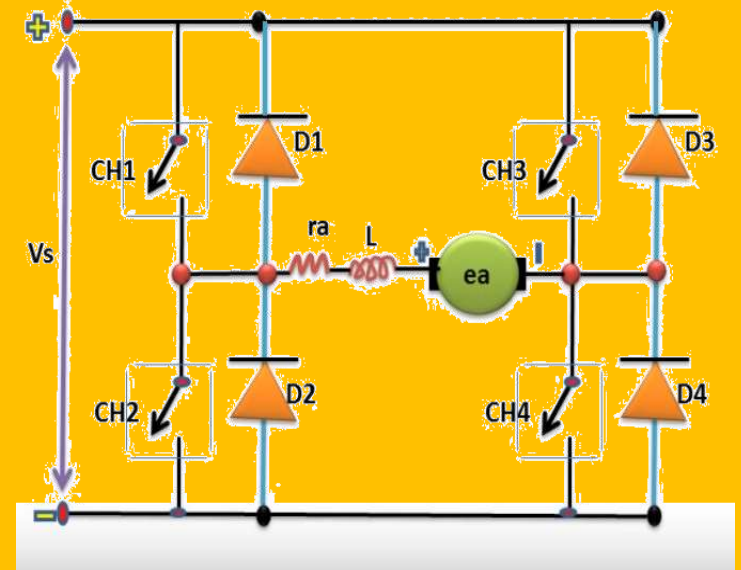
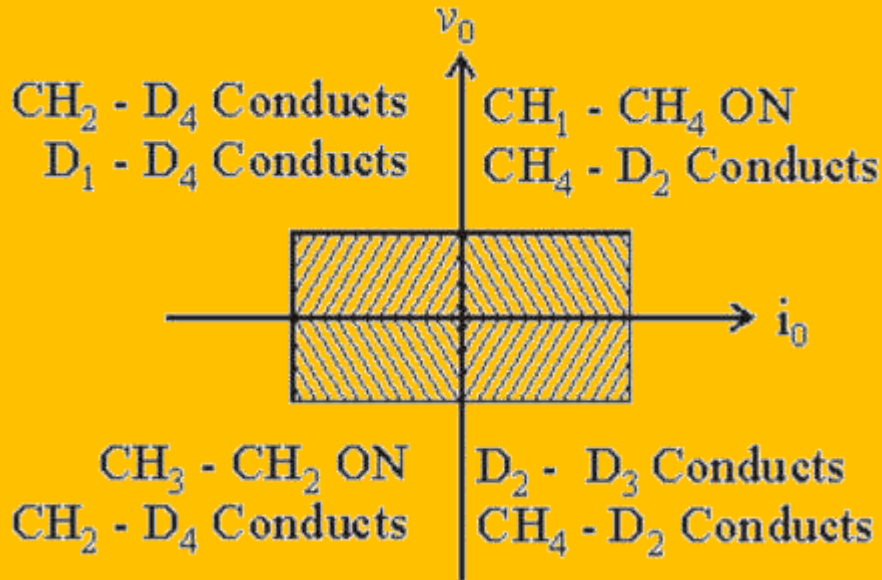
Current Flows through $V_a^+ - D_3 - V_{dc} - D_2 - V_a^-$

V_a is negative. But current I_a is positive

Operates in fourth quadrant



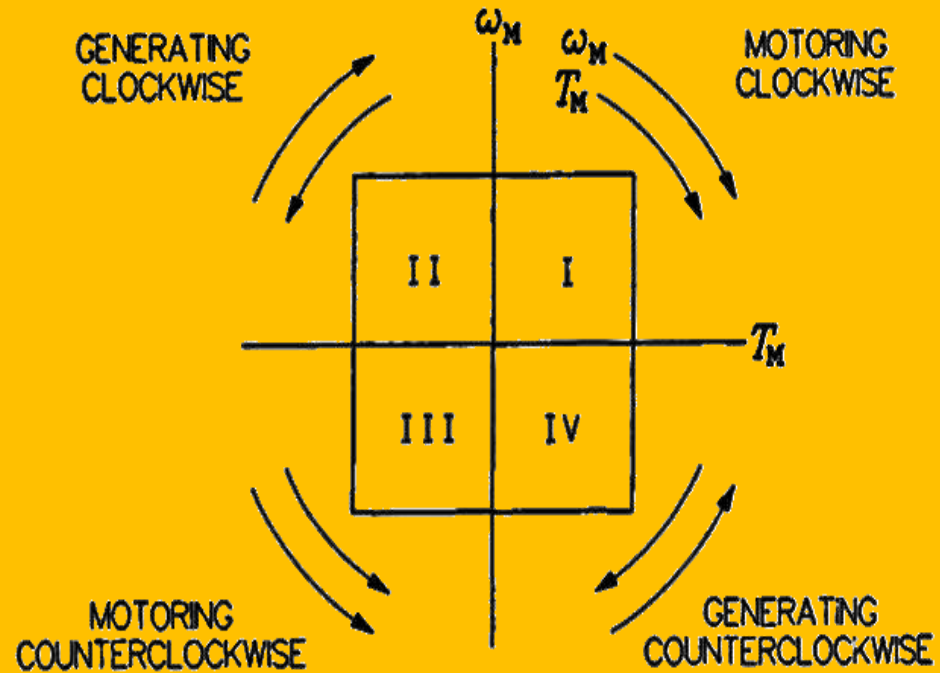
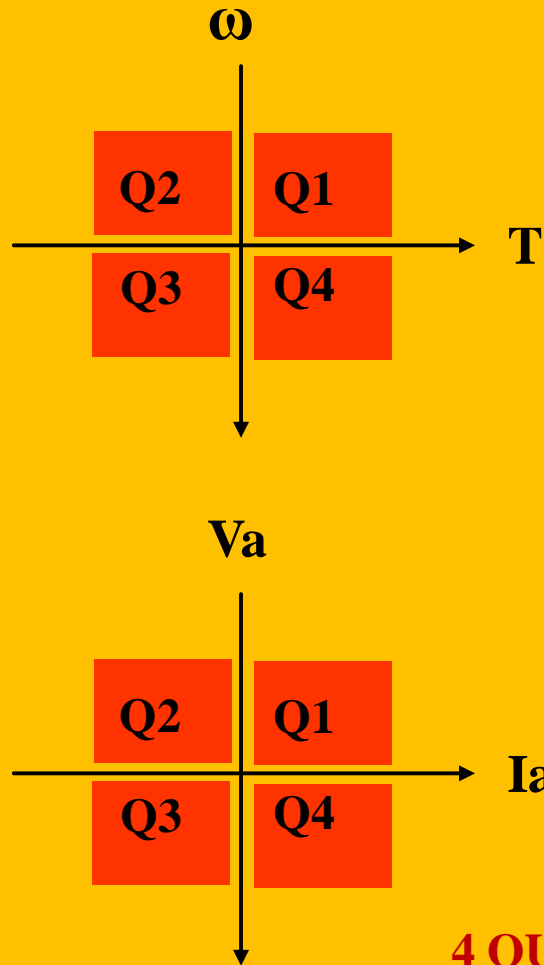
4 Q – CHOPPER FED DC DRIVE



OPERATION OF CIRCUIT WITH QUADRANT



4 Q – CHOPPER FED DC DRIVE



4 QUADRANT OPERATION with V & I



CHOPPER FED DC DRIVE - Advantages



Also called : Switched mode converters

- Switching at high frequency
- Reduces current ripple
- Increases control bandwidth
- Suitable for high performance applications



Evaluation Time

Summarize the
content...

MCQs



Thanking You.