SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

19EET301 / POWER ELECTRONICS AND DRIVES

V SEM EEE

UNIT 3 –AC CONVERTERS

MULTI STAGE SEQUENCE CONTROL

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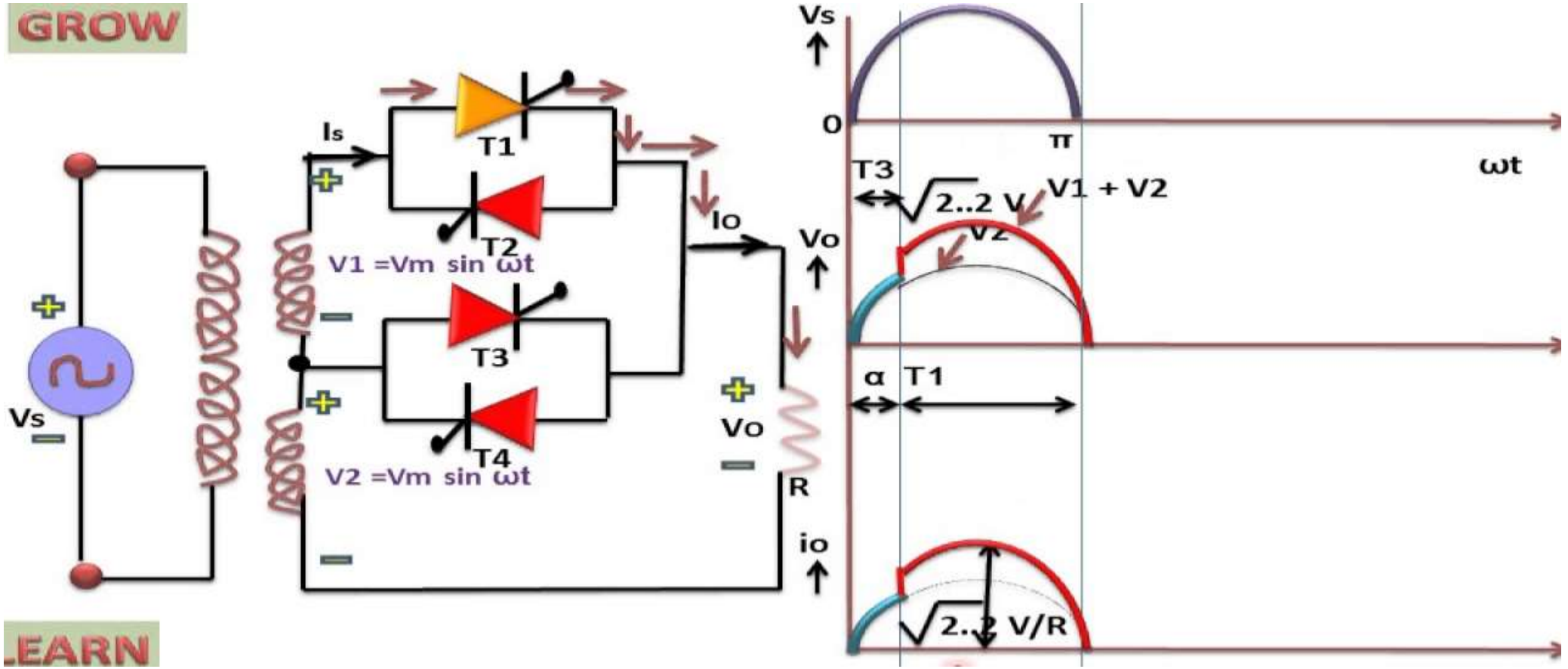
MULTISTAGE SEQUENCE CONTROL

Sequence control of ac regulators means the use of two or more stages of voltage controllers in parallel for the regulation of output voltage.

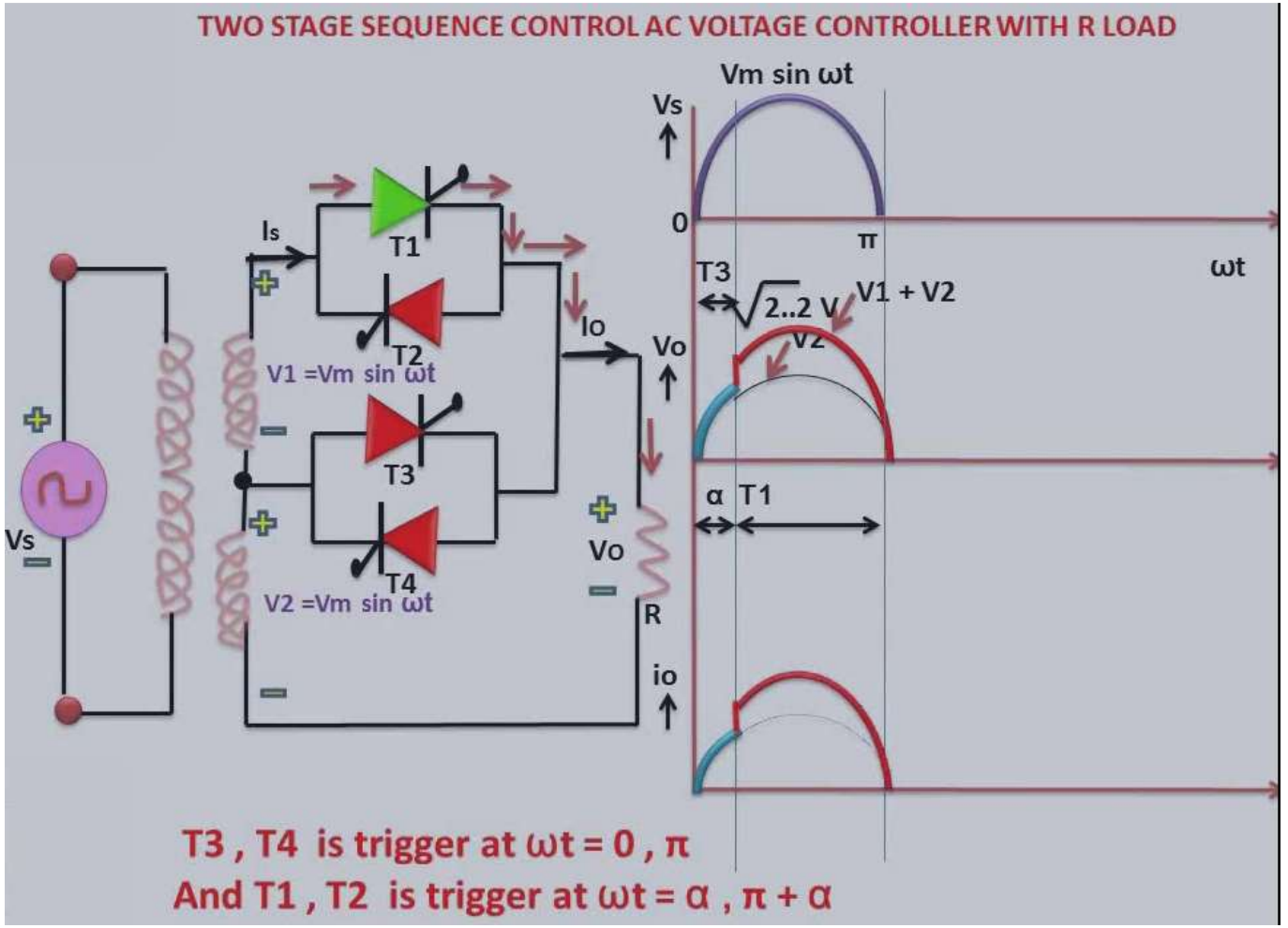
The sequence control of ac voltage controllers can be used as voltage controllers in supply systems & for the speed control of induction motors. These types of controllers are known as synchronous tap changers or transformer tap changers.

MULTISTAGE SEQUENCE CONTROL



MULTISTAGE SEQUENCE CONTROL

- Thyristors are used as static switches for on load changing of transformer connections.
- The turns ratio of the input transformer are such that if the primary instantaneous voltage is shown
  Vs= Vm sinωt
- Secondary instantaneous voltages are,
  V1= Vm sinωt
  V2= Vm sinωt
- When thyristors T3 & T4 are alternately fired with delay angle of α=0, the load voltage is Vo=V1.
- If full output voltage is required, thyristors T1 & T2 are alternately fired with delay angle of α=0 and full voltage Vo=V1+V2.



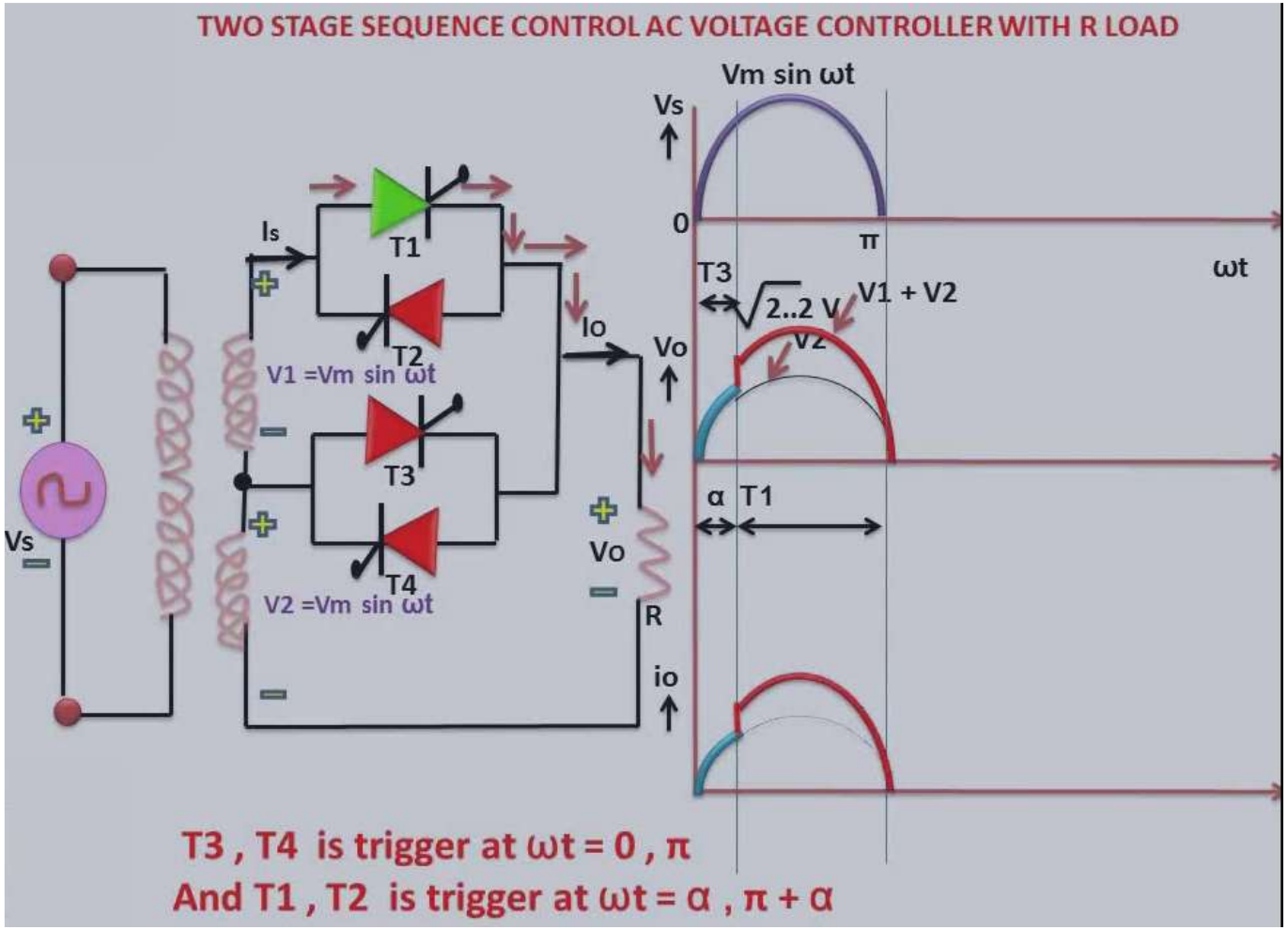
MULTISTAGE SEQUENCE CONTROL

The gating pulse of thyristors can be controlled to vary the load voltage. The RMS value of load voltage Vo can be varied within three possible ranges.

$0 < Vo < V1$,

$0 < Vo < (V1+V2)$,

$V1 < Vo < (V1+V2)$



MULTISTAGE SEQUENCE CONTROL

Case1: 0 < Vo < V1

To vary the RMS voltage within this range, T1 & T2 are turned off. T3 & T4 can be operated as a single phase ac voltage regulator. The RMS load voltage is given by,

$Vo=V1[1/\pi(\pi-\alpha+(\sin 2\alpha/2))]1/2$ and the firing angle range is $0<\alpha<\pi$.

Case2: 0 < Vo < (V1+V2)

T3 & T4 are turned off. T1 & T2 operate as a single phase ac voltage regulator, the load voltage is $Vo=(V1+V2)[1/\pi(\pi-\alpha+(\sin 2\alpha/2))]1/2$.

MULTISTAGE SEQUENCE CONTROL

Case3: V1 < Vo < (V1+V2)

T3 is turned on at ωt=0 and the secondary voltage V1 appears across the load. If T1 is turned on at ωt=α, T3 is reverse biased due to secondary voltage V2 & T3 is turned off. The voltage across the load is (V1+V2). At ωt=π, T1 is self commutated & T4 is turned on. The secondary voltage V1 appears across the load until T1 is fired ωt=π+α, t4 is turned off due to reverse voltage V2 and the load voltage is (V1+V2). At ωt=2π, T2 is self commutated, T3 is turned on again the cycle is repeated. This type of controller is also called as synchronous tap changer

THANK YOU