SINGLE PHASE BRIDGE INVERTER WITH RL LOAD

The operation of the circuit can be divided into four intervals or modes. The waveforms are as shown in Fig. 8.13.

**Interval I (t₁ – t₂):**
At instant t₁, the pair of transistors Q₁ and Q₂ is turned on. The transistors are assumed to be ideal switches. Therefore point A gets connected to positive point of dc source V through Q₁ and point B gets connected to negative point of input supply.

The output voltage \( V₀ = + V \) as shown in Fig 8.11(a). The load current starts increasing exponentially due to the inductive nature of the load.

The instantaneous current through Q₁ and Q₂ is equal to the instantaneous load current. The energy is stored into the inductive load during this interval of operation.

**Interval II (t₂ - t₃) :**
- At instant t₂ both the transistors Q₁ and Q₂ are turned off. But the load current does not reduce to 0 instantaneously, due to its inductive nature.
- So in order to maintain the flow of current in the same direction there is a self induced voltage across the load. The polarity of this voltage is exactly opposite to that in the previous mode.
- Thus output voltage becomes negative equal to \( -V \). But the load current continues to now in the same direction, through D₃ and D₄ as shown in Fig. 8.11(b).
- Thus the stored energy in the load inductance is returned back to the source in this mode. The diodes D₁ to D₄ are therefore known as the feedback diodes.
- The load current decreases exponentially and goes to 0 at instant t₃ when all the energy stored in the load is returned back to supply. D₃ and D₄ are turned off at t₃.

**Interval III (t₃ – t₄) **
- At instant t₃ ’ Q₃ and Q₄ are turned on simultaneously. The load voltage remains negative equal to \( -V \) but the direction of load current will reverse and become negative.
- The current increases exponentially in the negative direction. And the load again stores energy) in this mode of operation. This is as shown in Fig. 8.12(a).
Interval IV (t₄ to t₅) or (t₀ to t₁)

- At instant t₄ or to the transistors Q3 and Q4 are turned off. The load inductance tries to maintain the load current in the same direction, by inducing a positive load voltage.
- This will forward bias the diodes D₁ and D₂. The load stored energy is returned back to the input dc supply. The load voltage Vₒ = + V but the load current remains negative and decrease exponentially towards 0. This is as shown in Fig. 8.12(b).
- At t₅ or t₁ the load current goes to zero and transistors Q1 and Q2 can be turned on again.

Conduction period of devices:
- The conduction period with a very highly inductive load, will be T₀/₄ or 90° for all the transistors as well as the diodes.
- The conduction period of transistors will increase towards T₀/₂ or 180° with increase in the load power factor. (i.e., as the load becomes more and more resistive).

Source: [http://elearningatria.files.wordpress.com/2013/10/ece-vii-power-electronics-10ec73-notes.pdf](http://elearningatria.files.wordpress.com/2013/10/ece-vii-power-electronics-10ec73-notes.pdf)