Four Layer P-N-P-N Switching Devices
(Uni Junction Transistor)

Lecture – 6

TDC PART – II
Paper - III (Group - A)
Chapter - 4

by:

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- **(Uni Junction Transistor)**
- **Lecture Content :-**

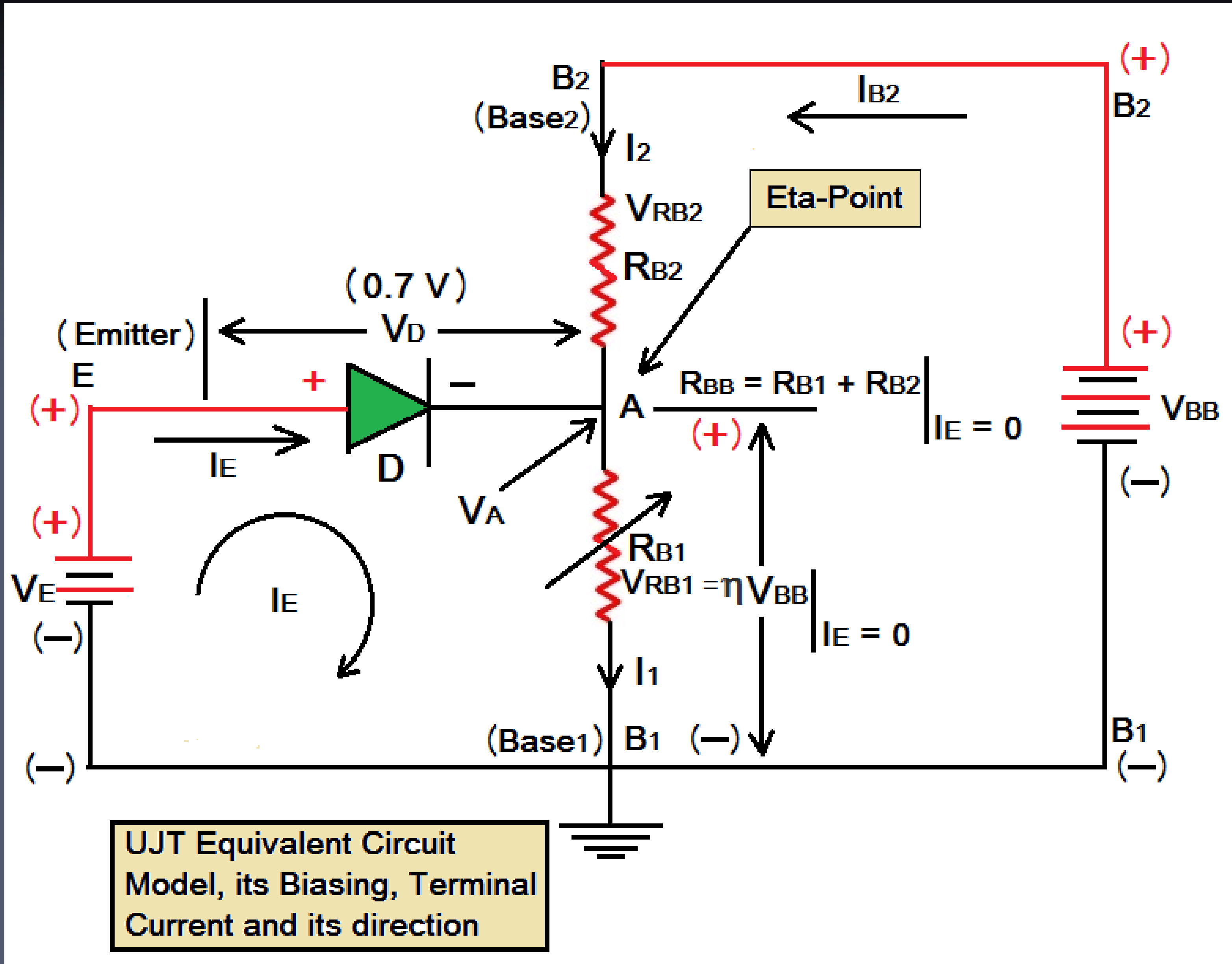
➢ **UJT Parameters**

➢ (3) Circuit Arrangement for UJT V-I Characteristics

UJT Parameters

- **(3) Circuit Arrangement for UJT V-I Characteristics**

- **For ease of understanding, the internal model of the UJT is used in the circuit shown below in Figure (14). (Base2) B_2 terminal of the UJT is** made **Positive (+) with respect to (Base1) B1 terminal using the** Voltage Source **V_{BB}. Emitter Terminal E of the UJT is Forward Biased using the Voltage Source V_E.**



- **Fig (14)** Shown Typical Circuit Diagram for UJT V – I Characteristics.

- **Current starts flowing** into the **Emitter only** when the **Bias Voltage V_E** has **exceeded the Forward Voltage drop of the Internal Diode (V_D) (0.7 V)** plus the **Voltage drop across R_{B1} (V_{RB1}).** This condition can be expressed using the following equation given below.

- $V_E = V_D + V_{RB1}$

- Considering the **Intrinsic Stand off Ratio** $\eta = R_{B1} / (R_{B1} + R_{B2})$, then the equation becomes,

- $V_E = V_D + \eta V_{BB}$

- A **typical Silicon Diode** has a **Forward Voltage drop of V_D = 0.7 V**. When this factor is considered, the equation can be re written as,

- $V_E = 0.7\ V + \eta\ V_{BB}$

- **This minimum value** of the **Emitter Voltage V_E** for which the **Emitter Current I_E starts to flow** is called the **Firing Voltage of UJT**.

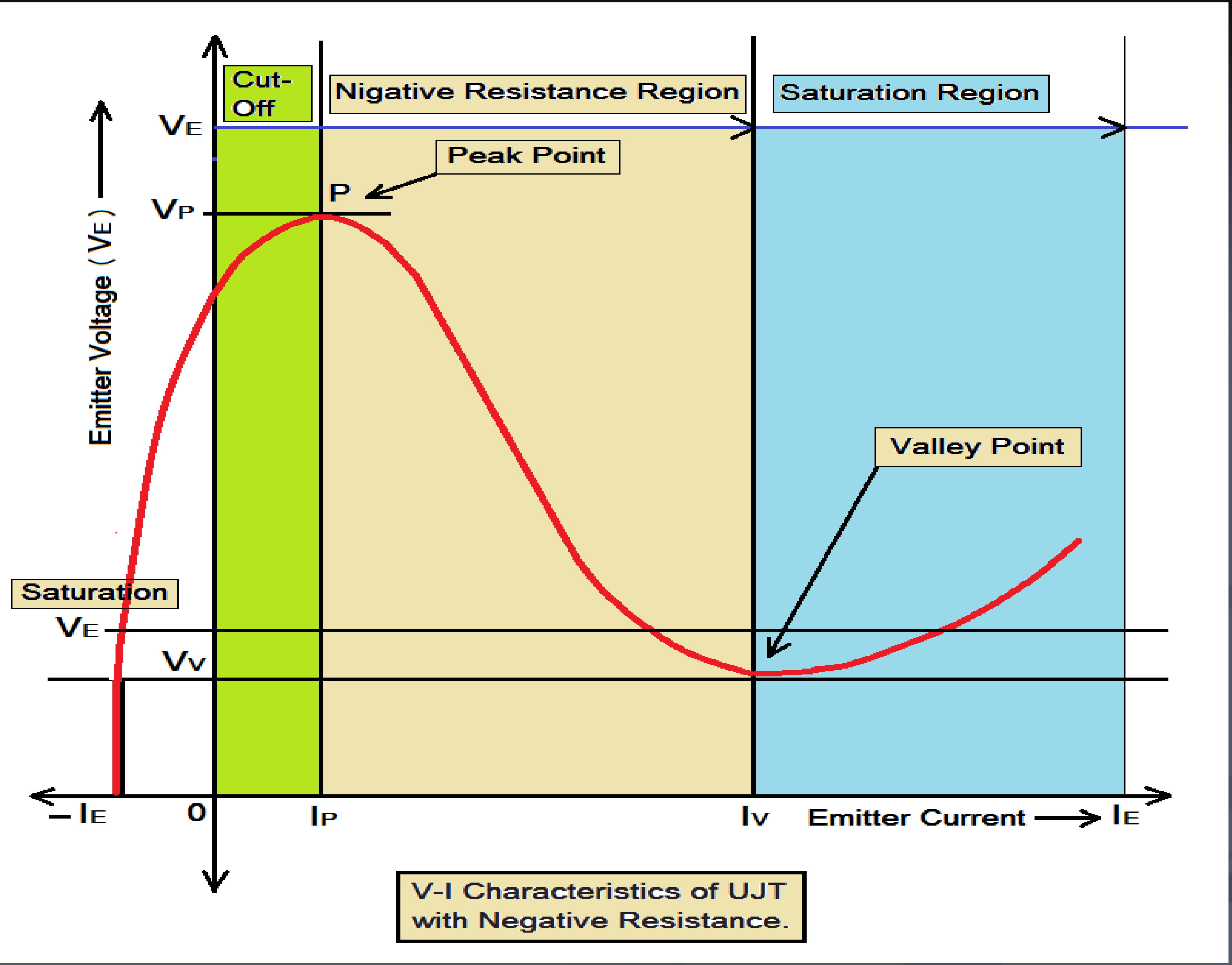
- As the **Emitter Voltage V_E** is **increased** the **Emitter Current I_E** is also **Increased** and the **junction behaves** like a **typical P-N Junction**. But the **Emitter Voltage V_E** can be only **Increased Up** to a **particular point** called **V_P (Peak Voltage).**

- At this **Peak Point V_P**, a considerable amount of **Emitter Current I_E flows** and a significant number of **Holes** are **Injected into the Junction**. These **Holes** are **repelled** by **(Base2) B_2** and attracted by **(Base1) B_1**.

- As a result, the **region between Emitter (E)** and **(Base1) B_1 terminal starts Saturating** by **Holes** and the **Conductivity** of this region starts to **Increase. This phenomenon of Increasing Conductivity by the Insertion of Holes is called Conductivity Modulation.**

- This **Increased Conductivity Reduces R_{B1}** and **Intrinsic Stand of Ratio (η).** This results in a condition where **Emitter Current I_E Increases** and the **Emitter Voltage V_E Decrease.** This situation is similar to a **Negative Resistance Scenario**.

- In the **V-I Characteristic of UJT,** which is shown in below **Figure (15),** we can see **that** the regions between **V_P (Peak Voltage Point) and V_V (Valley Voltage)** have a **Negative Slope.** This **Negative Resistance Region** in the **UJT Characteristics** is employed in **Oscillator Circuit.**



- **Fig (15)** Shown V-I Characteristics of UJT with Negative Resistance Region.

- At lasts the **Emitter Current I_E** will be **Increased to a point** that **no more Increase in Conductivity is possible.** This **point** is called **“Valley Point”.**

- The **Emitter Current I_E** corresponding to **Valley Point** is denoted as **I_V** and the corresponding **Emitter Voltage V_E** are denoted as **V_V**. Beyond the **Valley Point,** the **UJT** is **Fully Saturated** and the **Junction behaves like a Fully Saturated P-N junction**.

to be continued ………………..