SNS COLLEGE OF TECHNOLOGY

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Department of Biomedical Engineering

Course Name: 23BMB101-Electron Devices and Circuits

I Year : II Semester

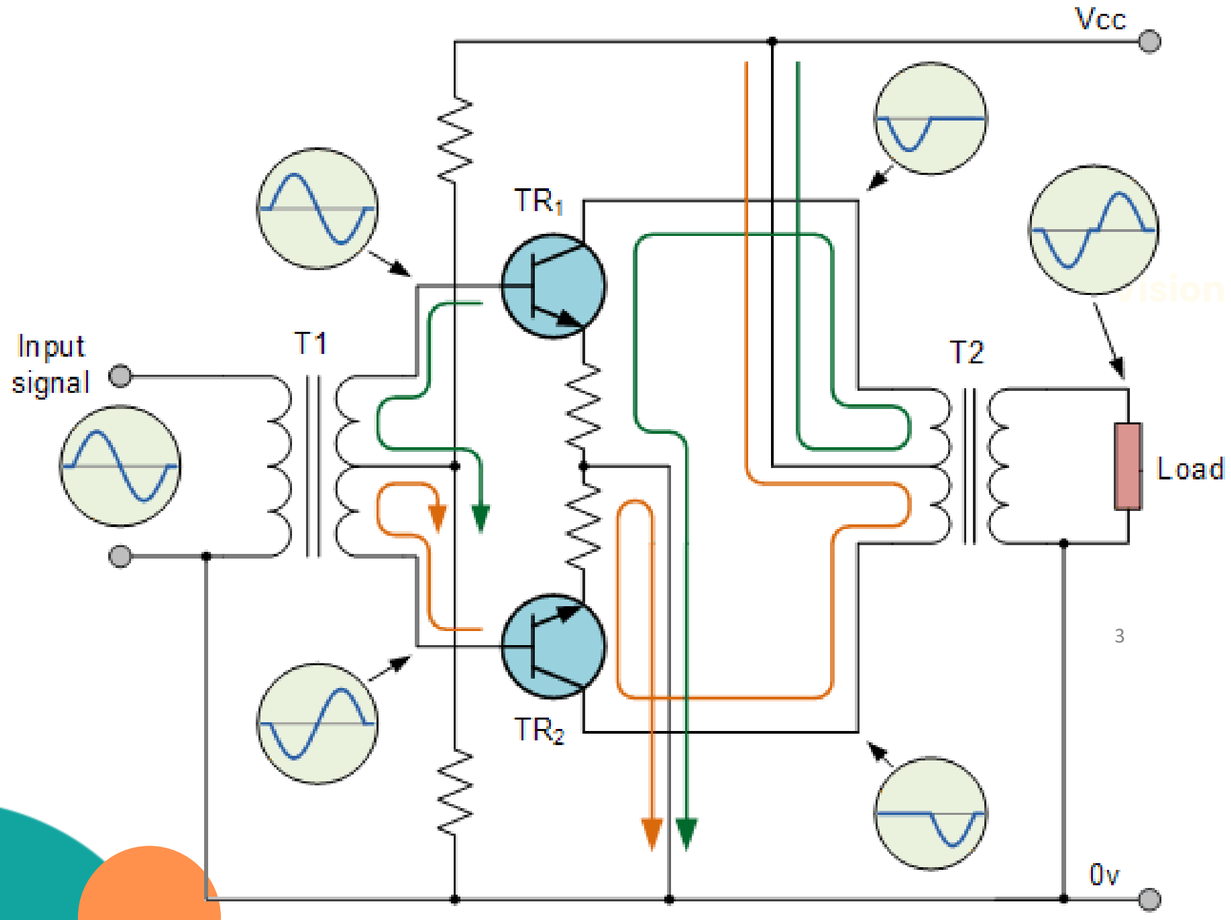
Unit IV –Power Amplifiers & Switching Circuits

Topic : Transformer Coupled Class B Amplifier

INTRODUCTION

- When the collector current flows only during the positive half cycle of the input signal, the power amplifier is known as class B power amplifier.
- The inefficiency of class A amplifiers is largely due to the transistor bias conditions. In a class B amplifier, the transistors are biased to cutoff, so that there is no transistor power dissipation when there is no input signal. This gives the class B amplifier a much greater efficiency than the class A circuit.
- It is possible to design the power amplifier circuit with two transistors in its output stage producing what is commonly termed as a Class B Amplifier also known as a **push-pull amplifier** configuration.

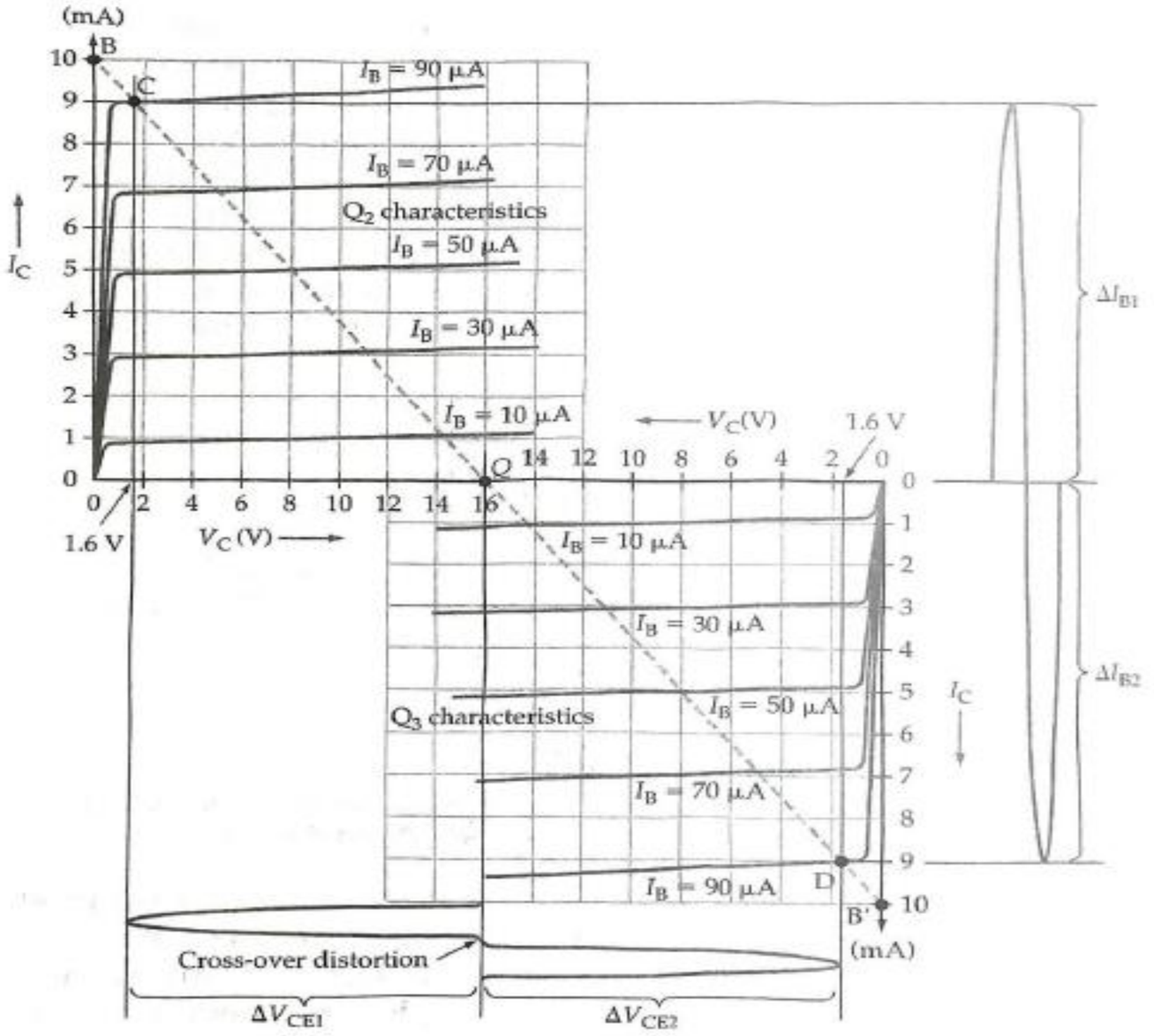
Class B Amplifier



- The circuit of a push-pull class B power amplifier consists of two identical transistors T1 and T2 whose bases are connected to the secondary of the center-tapped input transformer Tr1. The emitters are shorted and the collectors are given the VCC supply through the primary of the output transformer Tr2.
- When no signal is applied at the input, the transistors T1 and T2 are in cut off condition and hence no collector currents flow. As no current is drawn from VCC, no power is wasted.

Class B Amplifier

- The push-pull action is best illustrated by drawing the ac load line on the composite characteristics for Q2 and Q3. The composite characteristics are created by drawing the Q2 characteristics in the normal way and presenting the Q3 characteristics upside down.



Class B Power Amplifier

- The current in each transistor is the average value of half sine loop.

$$I_{dc} = \frac{(I_C)_{max}}{\pi}$$

$$(p_{in})_{dc} = 2 \times \left[\frac{(I_C)_{max}}{\pi} \times V_{CC}\right]$$

- R.M.S. value of collector current = $(I_C)_{max}/\sqrt{2}$
- R.M.S. value of output voltage = $V_{CC}/\sqrt{2}$

$$(P_O)_{ac} = \frac{(I_C)_{max}}{\sqrt{2}} \times \frac{V_{CC}}{\sqrt{2}} = \frac{(I_C)_{max} \times V_{CC}}{2}$$

- Overall efficiency $\eta_{overall} = \frac{(P_O)_{ac}}{(P_{in})_{dc}} = \frac{(I_C)_{max} \times V_{CC}}{2} \times \frac{\pi}{2(I_C)_{max} \times V_{CC}}$ = 78.5%

Cross-Over Distortion

- The waveform delivered to the transformer primary and the resultant output are not perfectly sinusoidal in the class B circuit.
- Cross-over distortion is produced in the output waveform because the transistors do not begin to turn on until the input base-emitter voltage is about 0.5 V for a silicon device or 0.15 V for a germanium transistor.
- To eliminate this effect, the transistors are partially biased on instead of being biased off. With this modification, the class B amplifier becomes a class AB amplifier.