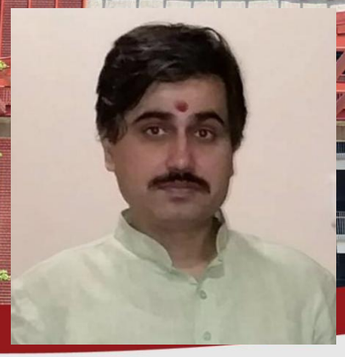
Analog Electronic Circuits
(UEC301)

By



Dr.Mayank Kumar Rai
Associate Professor,
ECED,TIET,Patiala

Thapar Institute of Engineering & Technology
(Deemed to be University)
Bhadson Road, Patiala, Punjab, Pin-147004
Contact No. : +91-175-2393201
Email : info@thapar.edu

THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

Subject: Analog Electronic Circuits (UEC301)

Faculty names: Dr. Mayank Kumar Rai (Associate Professor & Course Coordinator)

Topic of today's Lecture : BJT Biasing-I

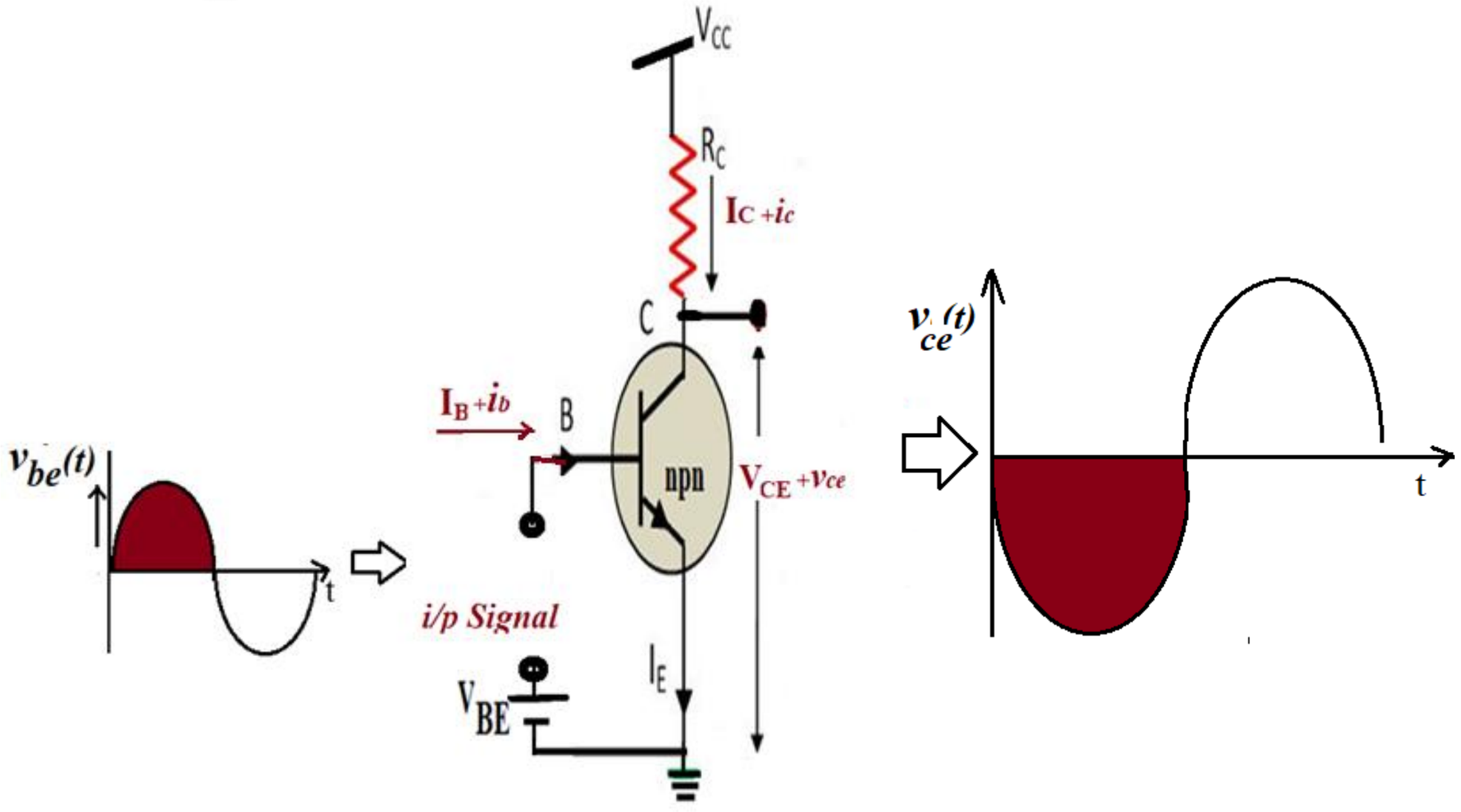
Key points

- ✓ Purpose of Transistor Biasing
- ✓ DC operating Points(i/p and o/p)
- ✓ Effects of Bias point location on Allowable Signal Swing
- ✓ Stabilization against Variations in I_{CO} and β

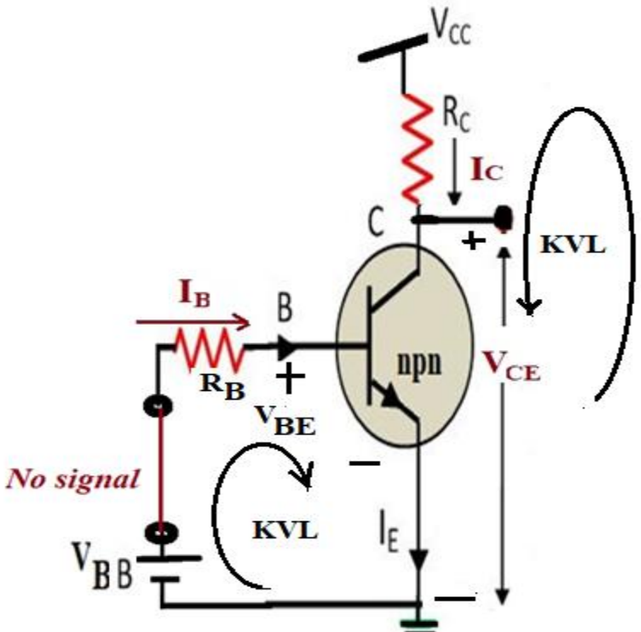
Contents of this lecture are based on the following books:

- *Jacob Milman & and C.C.Halkias,* ***"Integrated Electronics Analog and Digital Circuit and Systems"****Second Edition.*
- *Adel S. Sedra & K. C. Smith,* ***"MicroElectronic Circuits Theory and Application"*** *Fifth Edition.*
- *Robert L. Boylestad & L. Nashelsky,* ***"Electronic Devices and Circuit Theory"*** *Eleventh Edition.*

Purpose of Transistor Biasing



DC operating Points(i/p and o/p)

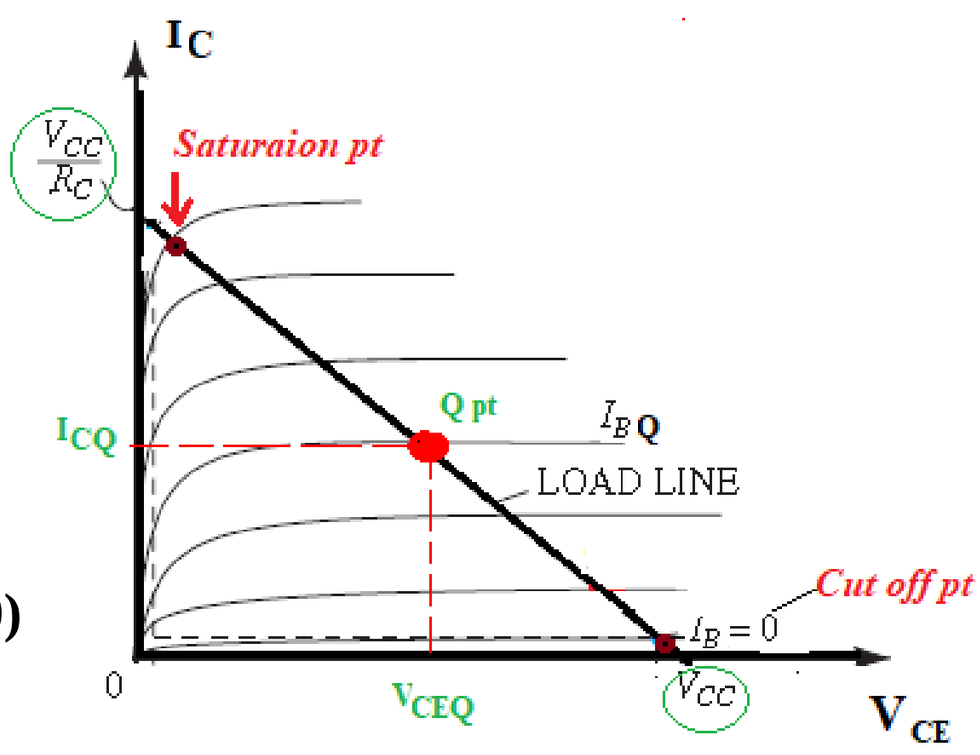


Output Char.

$V_{CE} = V_{CC} - I_C R_C$ ... (2)

$V_{CE} = V_{CC}$ when $(I_C=0)$

$I_C = V_{CC}/R_C$ when $(V_{CE}=0)$

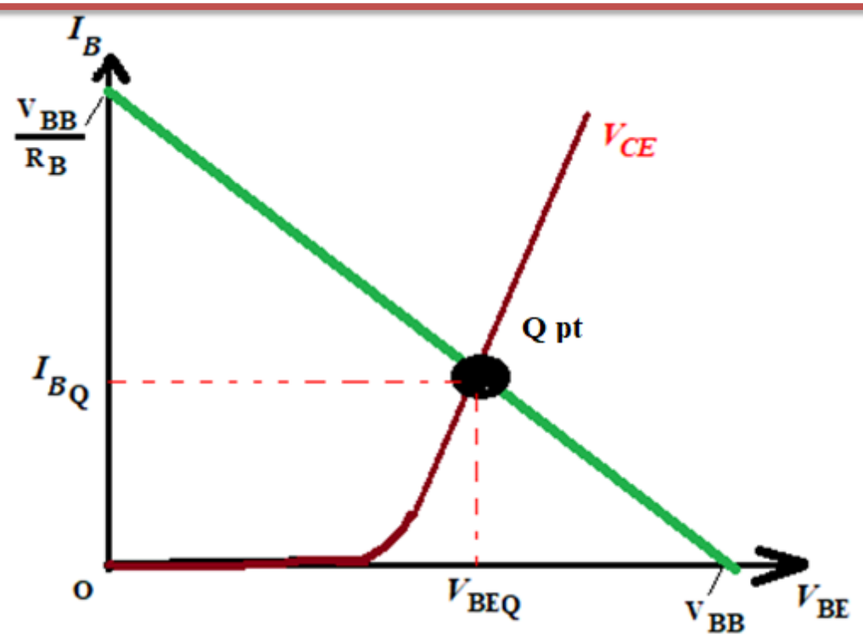


Input char.

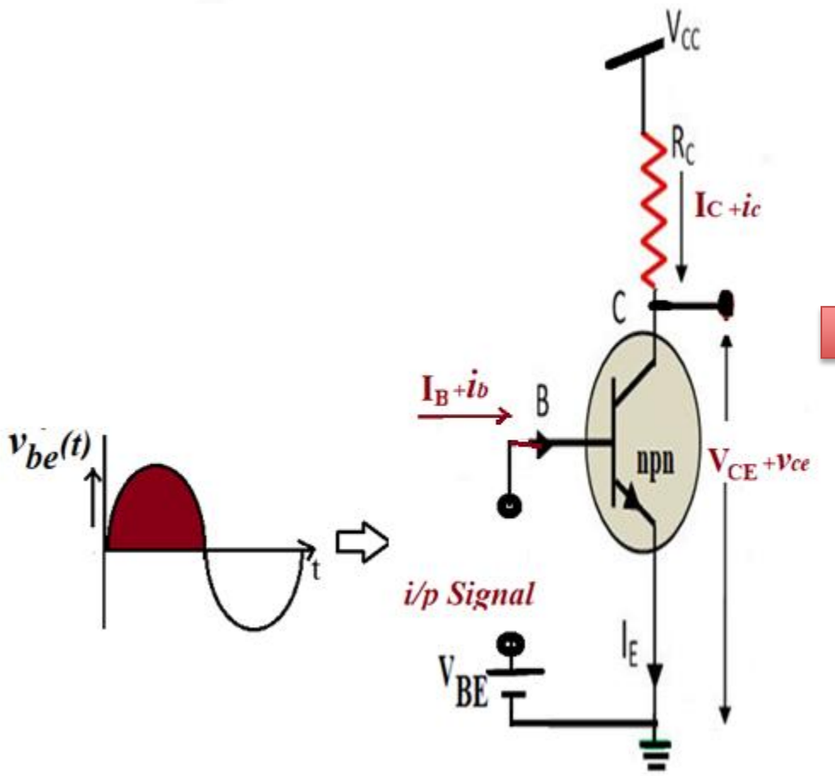
$V_{BB} = V_{BE} + I_B R_B$ ... (1)

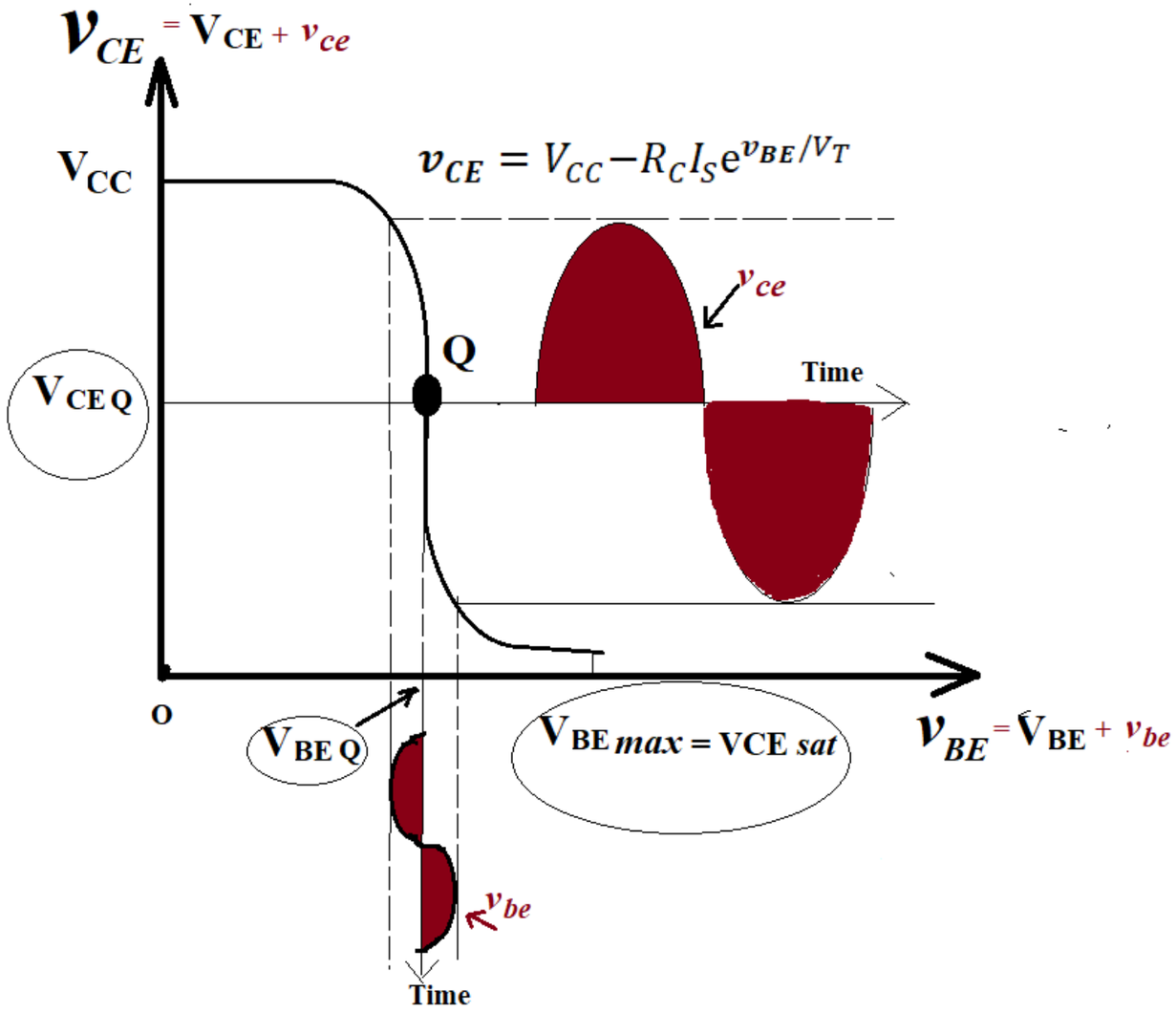
$V_{BE} = V_{BB}$ when $(I_B=0)$

$I_B = V_{BB}/R_B$ when $(V_{BE}=0)$



Transfer characteristic of the CEC based CKT, biased at Q point



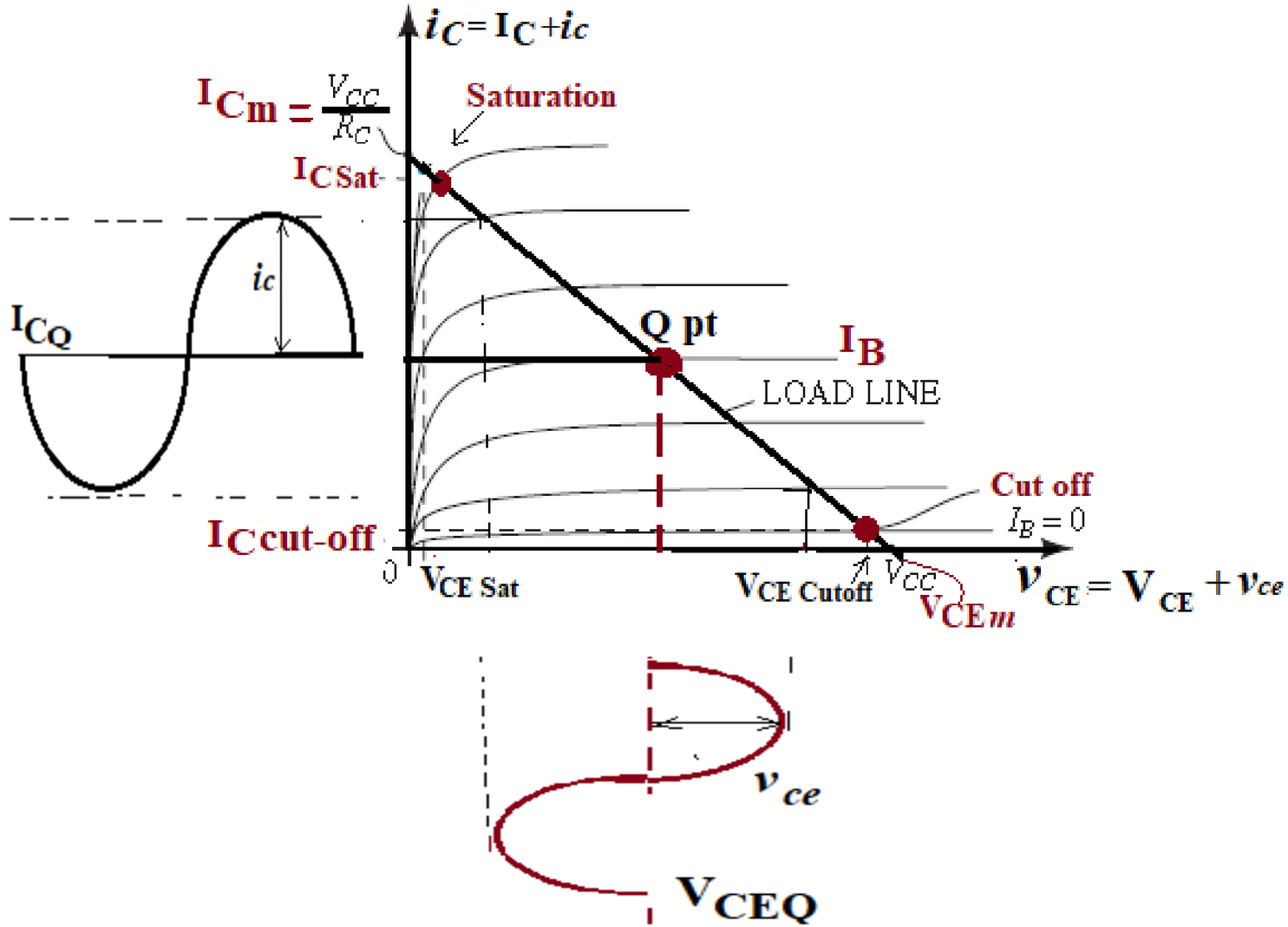


$$v_{CE} = V_{CC} - R_C i_c$$

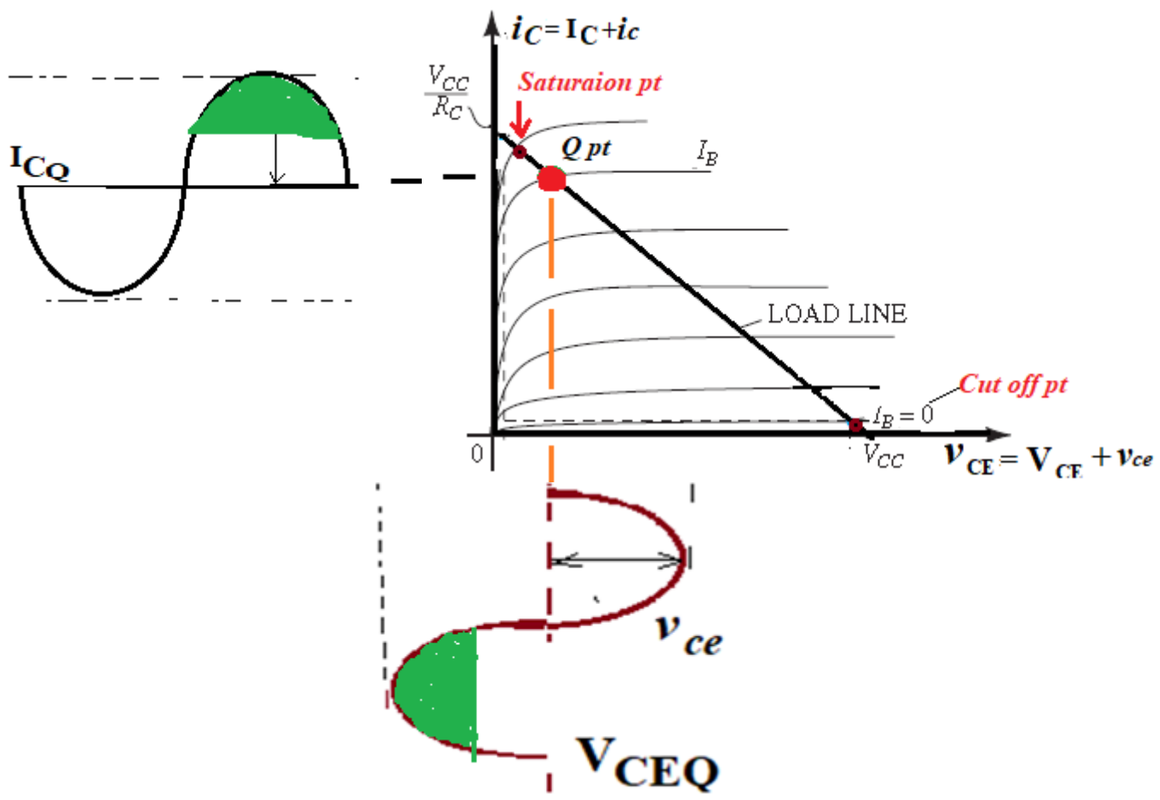
$$i_c \cong I_S e^{v_{BE}/V_T}$$

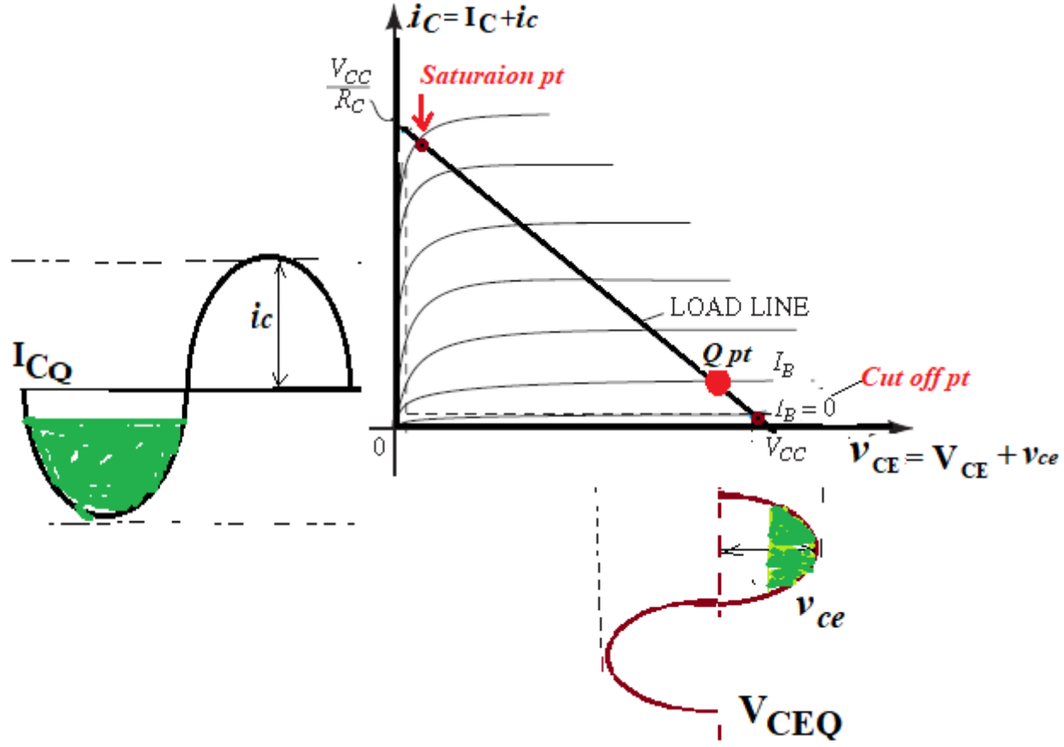
$$v_{CE} = V_{CC} - R_C I_S e^{v_{BE}/V_T}$$

Output characteristic of the CEC based CKT, biased at Q point



Effects of Bias point location on Allowable Signal Swing





Stabilization against Variations in I_{CO} and β

Stabilisation of Q pt.

The collector current in transistor changes rapidly when: ***The temperature changes,***

$I_C = \beta I_B + I_{CO}$ ....(i)

β & I_{CO} = function of temperature

Stability Factor (*S*) = dI_C/dI_{CO}

Thermal Runway

$I_{CO} \uparrow = T \uparrow$ ⟹ $\uparrow I_C = \uparrow \beta I_B + I_{CO} \uparrow$

Thank You