Unit -> 2

Subject -> Analog ckt

Faculty -> Dr. Nidhi chauhan

Paper code -> BT-402

Lecture 1 -> High freequeny transistor model

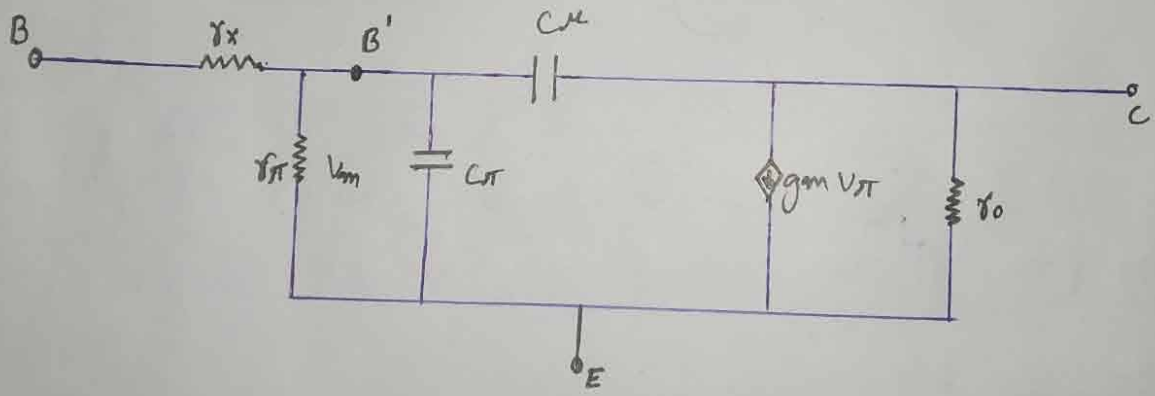
UNIT-2

High Frequency transistor Model

When input Signal to amplifier is in the range of ten to Hundred kilo Hertz, a Small Signal - low frequency model of transistor Can be used for analysis. But as the frequency increases Internal Capacitance of the transistor will strongly effects its performance. A

A Low frequency model Cannot work well in this situation. to accomodate these performance changes of the transistor. a seperate model is developed for high frequency Operations.

This high frequency model is given in fig. A high frequency hybrid - pi model is also known as Giacolletto model.



High frequency Model Explained → In High frequency model a resistor and two Capacitor are added In addition to the Components in low frequency Model.

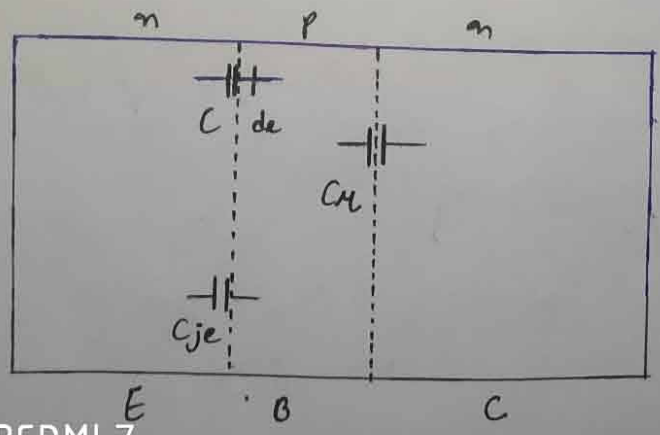
① Resistor r_x is known as Base - spreading resistor.

In fig. B' is a point Internal to the transistor and is a part of base region. r_x Denotes the Resistance of the Silicon Material between External base terminal B'. Its' value is usually less than 100 ohms and has significant effect In high frequency response. It does not have any roll in low frequency analysis. $r_x << r_{\pi}$.

② Base - Emitter Capacitance C_{π} ⇒ This Capacitance Occurs due to Combined effect of emitter junction diffusion Capacitance C_{de} and Emitter junction depletion Capacitive C_{je}. (Diffusion and Depletion Capacitance are in your 'Solid state Devices' text book.) It's value is in between few PF to Few tens of PF.

③ Collector - Base Capacitance C_{μ} ⇒ It is the Capacitance of the Collector - Base junction of the transistor. It is ranging from fraction to PF to a few PF.

Internal Capacitance of BJT ⇒



③ E-B junction is forward biased. both diffusion and Depletion / space charge / Capacitance are associated with a forward Biased junction. So C_{de} and C_{je} forms C_π.

C-B junction is reverse biased and depletion Capacitance appear at the junction and the is represented as C_μ.