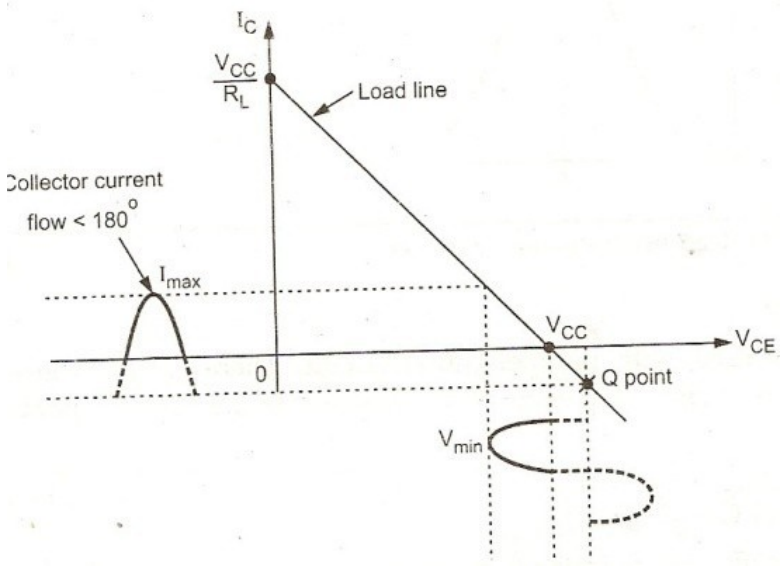
L – 15: Class "C" Tuned Amplifiers:

Meaning of Class – C Tuned Amplifier

A Class "C" Tuned Amplifier is an amplifier which the Q point and the input signal are selected such that the output signal is obtained for less than a half cycle, for a full input cycle.

Due to such a selection of the Q point, the transistor remains active, for less than a half cycle, hence only that part is reproduced at the output. For the remaining cycle of the input cycle, the transistor remains $cut-off$ and no signal is produced at the output.



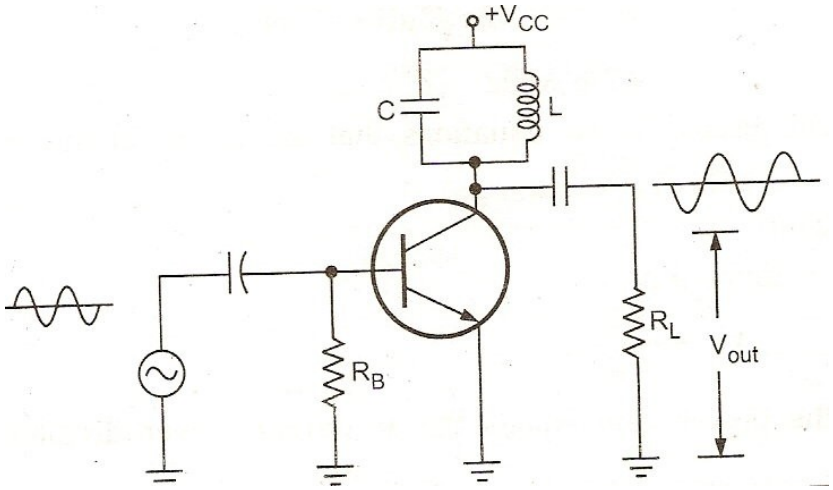
Current and voltage waveforms for Class "C" amplifier operation shows that it is apparent that the total angle through which current flows is less than 180^0 . This angle is called the conduction angle, θ_c

A parallel resonant circuit acts as load impedance. As collector current flows for less than half a cycle, the collector current consists of a series of pulses with the harmonics of the input signal.

Circuit diagram of Class – C tuned amplifier

A parallel tuned circuit acting as load impedance is tune to the input frequency; therefore it filters the harmonic frequencies and produces a sine wave output voltage consisting of

fundamental component of the input signal. The output voltage is maximum at the resonant frequency of the parallel tuned circuit. $f_r = \frac{1}{2\pi\sqrt{LC}}$



Efficiency of Class "C" Tuned Amplifiers:

The efficiency of a Class "C" Tuned Amplifier;

$$\eta = \frac{P_{out}}{P_{dc}} \times 100\% = \frac{P_{out}}{V_{cc} \times I_{dc}} \times 100\%$$

When the conduction angle $\theta_c = 180^0$ the efficiency $\eta = 75\%$

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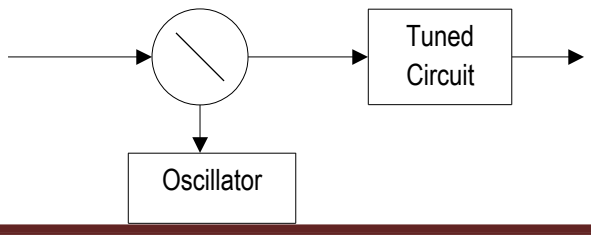
The efficiency of class – "C" amplifiers increases when the conduction angle decreases and at very small conduction angle, maximum efficiency $(\eta \simeq 100\%)$ is approached.

Bandwidth $BW = f_2 - f_1 = \frac{f_r}{Q}$;

Where Q - quality factor of the circuit,

Applications of Class "C" Tuned Amplifiers:

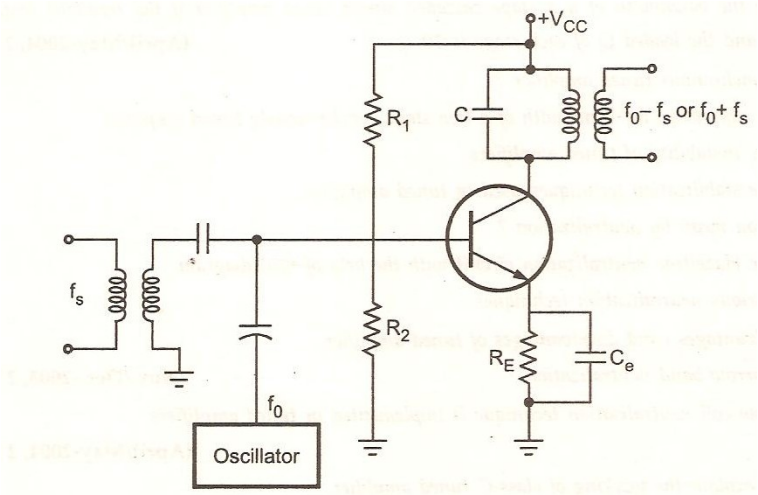


Class "C" Tuned Amplifiers are used in:

i. Mixer (frequency converter) circuits. Frequency conversion is

the process of translating a modulated signal to a higher or lower frequency while still retaining the original transmitted information.

ii. Frequency multiplier if the resonant circuit is tuned to a harmonic of the input signal.



iii. RF oscillators,
iv. RF amplifier,
v. FM transmitters,
vi. Booster amplifiers,
vii. High frequency repeaters.