

Experiment #12

Colpitt and Hartley oscillator

Objective.

To implement and analyze the Colpitt and Hartley oscillator.

Equipment

Resistors
DMM
Dc supply
Oscilloscope
Capacitor
Inductor

Theory

Colpitt oscillator

It consist of tank circuit which is an LC resonance sub circuit made of two series capacitor connected in parallel to an inductor and frequency of oscillator can be determined by using values of these capacitor and inductor.

The capacitor C1 and C2 form a potential divider and this tapped capacitance in tank circuit can be used as source for feedback and this setup can be used to provide better frequency stability.

Working

An AC voltage is produced across C1 and C2 by oscillatory current in tank circuit. While these capacitors get fully discharged the electrostatic energy stored in the capacitor get transferred in the form of magnetic flux to inductor and thus inductor get charged.

Similarly when inductor discharges capacitors C1 and C2 get charged and this process of charging and discharging cause oscillator.

Resonant frequency

The resonant frequency of Colpitt oscillator is given as

$$f_r = \frac{1}{2\pi\sqrt{LC_T}} \quad (12.1)$$

Where

$$C_T = \frac{C_1 C_2}{C_1 + C_2} \quad (12.2)$$

Circuit Diagram

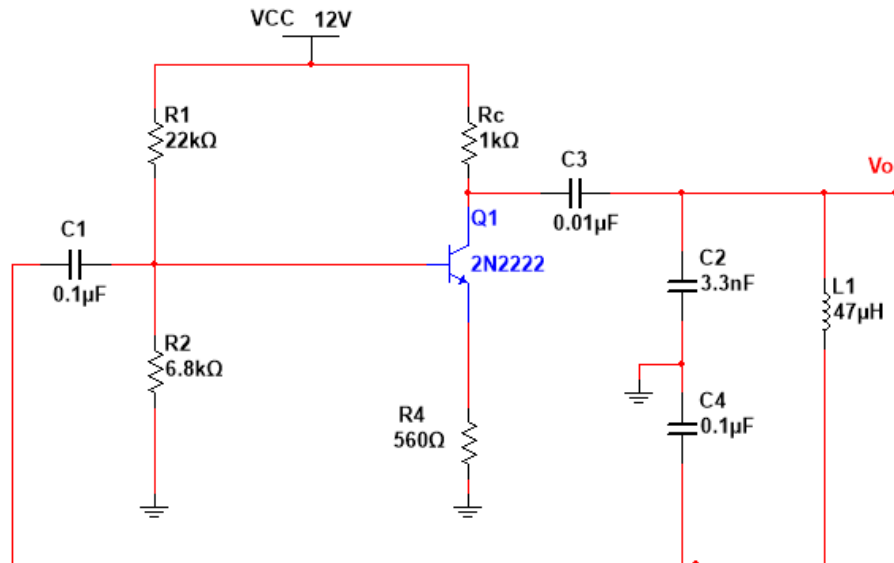


Figure 12.1: Colpitts Oscillator

Procedure

1. Set the trainer IT 2010.
2. Locate the Colpitts oscillator block and connect circuit according to given diagram.
3. Connect the circuit to 12V and ground.
4. Thus, oscillator is self-oscillatory and will start to oscillate as power is switched ON.
5. Record frequency of oscillator and verify according to the formula.
6. Repeat the steps 2,3,4 and 5 for Hartley oscillator.

Lab task

1. In Colpitts oscillator put $L = 100\mu$ and find value of f_r ?
2. In Hartley oscillator put $C = 47\text{pF}$ and find value of f_r ?

Conclusion
