APC

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad – 500 043

LABORATORY WORK SHEET

Date: 4.06.2022

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Exp No: 06 Experiment Name: Hartley and colpitts oscillator

DAY TO DAY EVALUATION:

	Preparation	Algorithm / Performance in the Lab	Source Code / Calculations and Graphs	Program Execution / Results and Error Analysis	Viva	Total
Max. Marks	4	4	4	4	4	20
Obtained	4	3	3	3	3	16

Signature of Lab I/C

START WRITING FROM HERE:

Aim:- To find practical frequency of a hartley and colpitts oscillator and to compare it with theoritical frequency for L=10mH, C=0.01μF, 0.033 μF & 0.047 μF

Software Required:- Multisim Software, Analog device Edition 13.0

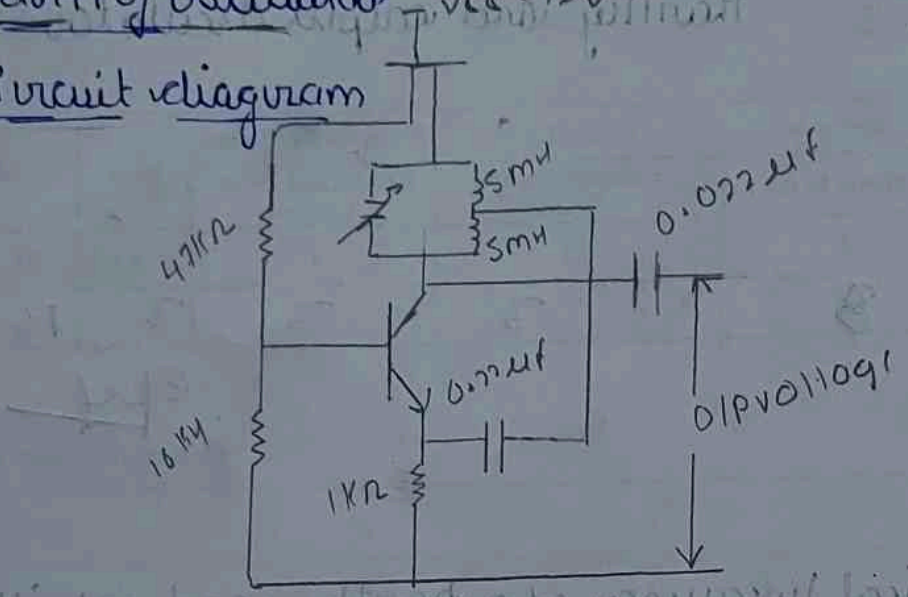
* components Required *

S.NO	Device	Range	Quantity
1.	DC Supply Voltage	12V	1
	Inductor	5mH	2
	Capacitor	0.22μF	2
		0.01μF	1
		0.033μF	1
		0.047μF	1
	Resistor	1K, 47K, 10K	

2.	Oscilloscope	10-20 MHz	1
3.	connecting wires	SA	4

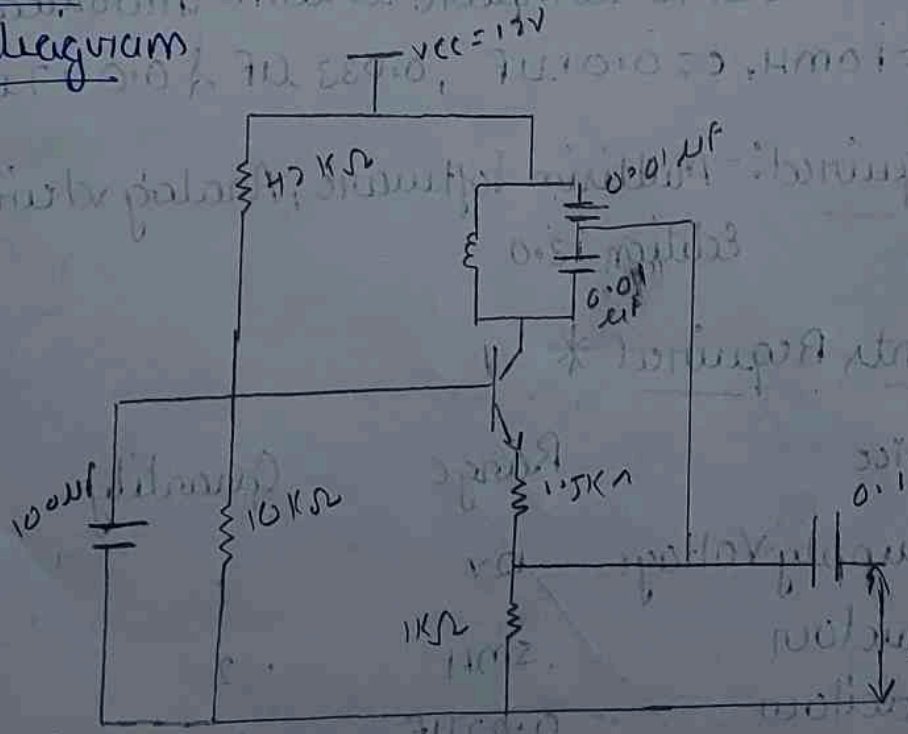
Hartley Oscillator

circuit diagram

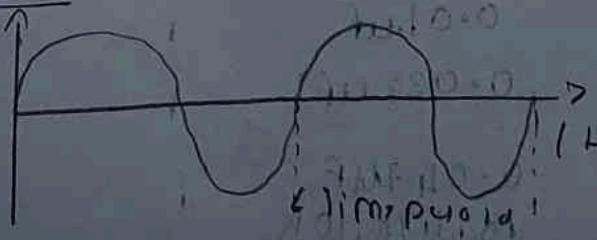


colpitts oscillator

circuit diagram



Madd waveform



Procedure:- Hartley oscillator

Connect the circuit as shown in figure.

Connect 0.01μF capacitor in the circuit and observe the waveform.

Note down the time period of the waveform and calculate the frequency $f = 1/T$

Now connect the capacitance to 0.033μF & 0.047μF of calculate the frequency and tabulate the reading as shown

Find the theortical frequency from the formula $f = \frac{1}{2\pi\sqrt{LC}}$

Where $L_T = L_1 + L_2 = 5mH + 5m = 10mH$ & compare theortical & practical values

Colpitts oscillator

Connect the circuit as shown in figure

Connect the $C_2 = 0.001\mu F$ in the circuit & observe the waveform

Calculate the time period & frequency of the waveform ($F = 1/T$)

Now fix the capacitance to 0.002μF then to 0.003μF of calculate the frequency tabulate the readings as shown

Find theortical frequency from the Formula $f_0 = \frac{1}{2\pi\sqrt{2\left(\frac{C_1C_2}{C_1+C_2}\right)}}$

Compare theortical of practical values.

Plot the graph o/p voltage Vs time period of practical frequency.

Result:- The frequency of oscillation of Hartley & Colpitts oscillators is measured practically and compared with theortically values.

Hartley's Tabular column :-

S.NO	L(mH)	C(HF)	Theoretical Frequency	Time period	Practical Frequency	V_0(V)
1.	10	0.01	15.915	69.120 μsec	14.486 KHz	27.60 V
2.	10	0.033	8.761	120.203 μsec	8.31 KHz	27.162
3.	10	0.047	7.341	142.602 μsec	6.994 KHz	28.251

calculations

$$f = \frac{1}{2\pi\sqrt{LC}}$$

$$f = \frac{1}{2\pi\sqrt{10\times10\times0.01\times10^{-6}}} = 15.915\ KHz$$

$$f = \frac{1}{2\pi\sqrt{10\times10^{-3}\times0.03\times10^{-6}}} = 8.761\ KHz$$

$$f = \frac{1}{2\pi\sqrt{10\times10^{-3}\times0.047\times10^{-6}}} = 7.341\ KHz$$

Colpitts Tabular column :-

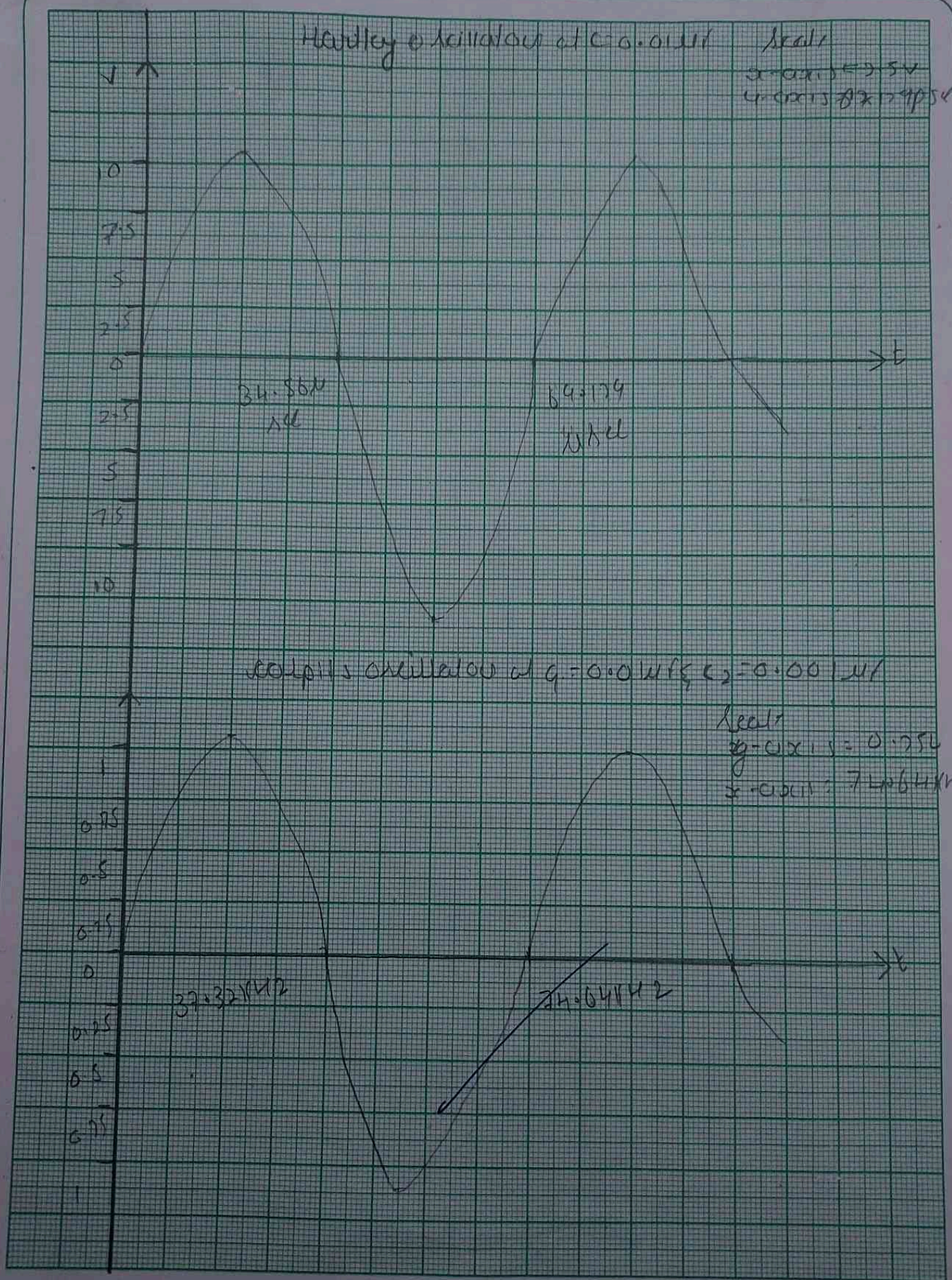
S.NO	L(mH)	C_1(μF)	C_2(μF)	C_T	Theoretical Frequency	practical Frequency	V_0(V)
1.	5	0.01	0.001	9.09×10^{-9}	74.6 KHz	71.35 KHz	7.472
2.	5	0.01	0.002	1.667×10^{-9}	55.129 KHz	50.76 KHz	3.04 V
3.	5	0.01	0.003	2.307×10^{-9}	46.840 KHz	47.51 KHz	5.44

$$C_T = \frac{C_1C_2}{C_1+C_2} \qquad f = \frac{1}{2\pi\sqrt{LC_T}}$$

1. $C_T = \frac{0.01\times0.01}{0.01+0.001} = \frac{10^{-5}}{0.011} = 9.09\times10^{-9}$ $f = \frac{1}{2\pi\sqrt{5\times10^{-3}\times9.09\times10^{-9}}}$

2. $f = \frac{1}{2\pi\sqrt{5\times10^{-3}\left(\frac{0.01\times0.002}{0.01+0.002}\right)\times10^{-6}}} = \frac{1}{2\pi\sqrt{5\times10^{-3}\times1.667\times10^{-9}}} = 55.129\ KHz$

Hartley oscillator at C = 0.01 μF



Colpitts oscillator at $C_1 = 0.001\ \mu F$, $C_2 = 0.001\ \mu F$