Department of Electrical Engineering
Assignment
Date: 24/06/2020

Course Details

Course Title: Electronic Circuit Design **Module:** 04
Instructor: Eng Mujtaba Ihsan **Total Marks:** 50

Student Details

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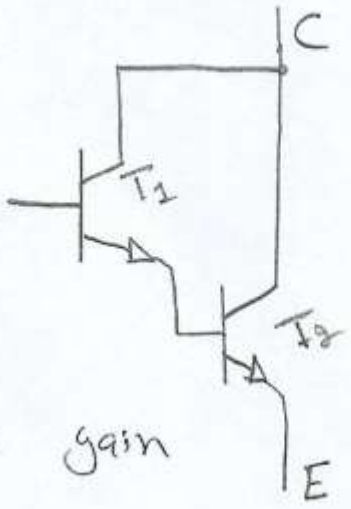
Q1.	(a)	**Discuss** the darlington connection for multistage amplifiers.	Marks 05+10
	(b)	The input of a certain regulator increases by 4.5 V. As a result, the output voltage increases by 0.062 V. The nominal output is 40 V. **Evaluate** the line regulation in both % and in %/V	CLO 2
Q2.		**Explain** Colpitts and Hartley oscillators.	Marks 10
			CLO 2
Q3.	(a)	**Describe** the idea behind class B amplifiers.	Marks 06+06
	(b)	**Explain the** types of voltage regulators and their purposes.	CLO 2
Q4.		**Explain** the working of Flash ADC.	Marks 05
			CLO 2
Q5.		**Differentiate** between the following:	Marks 04+04
	(a)	Low pass & high pass filters	
	(b)	Active and passive filters	CLO 2

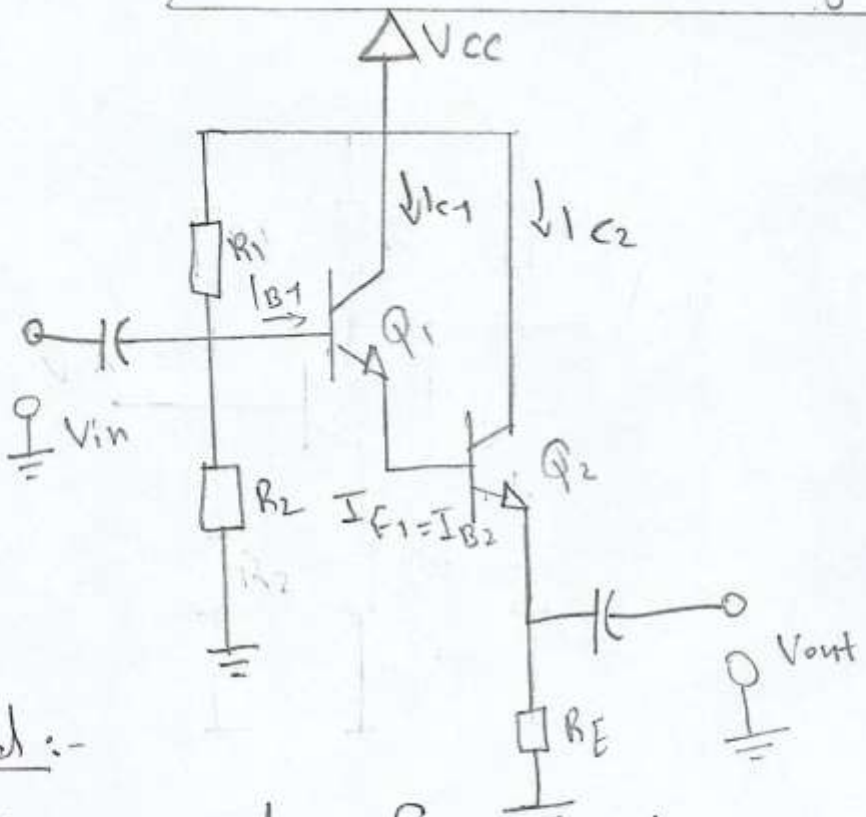
Q1.	(a)	**Discuss** the darlington connection for multistage amplifiers.	Marks 05+10

Darlington Pair



- Darlington Pair is a Cascading of two Biopolar Transistor.
- Used for High current gain & low resistance.

Multi stage Darlington Pair Amplifier



Explained :-

It is used for interconnecting Common-emitte stages with other emitter follower stages.

The above circuit shows the darlington Pair multistage amplifier which was just discussed to meet the requirment of

of current gain (A_i) & input impedance

- It have high input impedence (MΩ)
- High current gain
- low output impedance.

(b)	The input of a certain regulator increases by 4.5 V. As a result, the output voltage increases by 0.062 V. The nominal output is 40 V. **Evaluate** the line regulation in both % and in %/V	CLO 2

b)

Given data:-

Input voltage $= V_{IN} = 4.5$

Output voltage $= \Delta V_{out} = 0.062\ V$

Nominal output $= 40V$

By using Line Regulation equation

$$\text{Line regulation} = \left(\frac{\Delta V_{out}}{\Delta V_{IN}}\right) \times 100\%$$

$$= \frac{0.062}{4.5} \times 100\ \%$$

$$= 1.3777\ \%$$

$$\text{Line regulation} = \frac{(\Delta V_{out}/V_{out}) \times 100\%}{\Delta V_{IN}}$$

$$= \frac{0.062/40}{4.5} \times 100\%$$

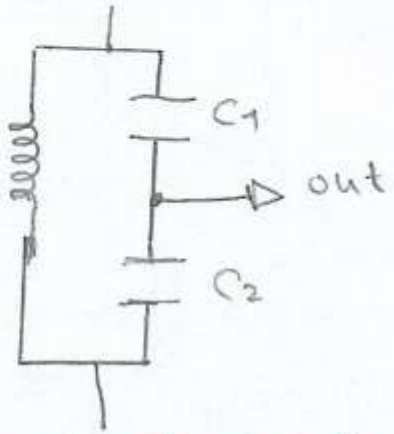
$$= 0.0344\ \%/V$$

Q2.		**Explain** Colpitts and Hartley oscillators.	Marks 10
			CLO 2

Q2 :-

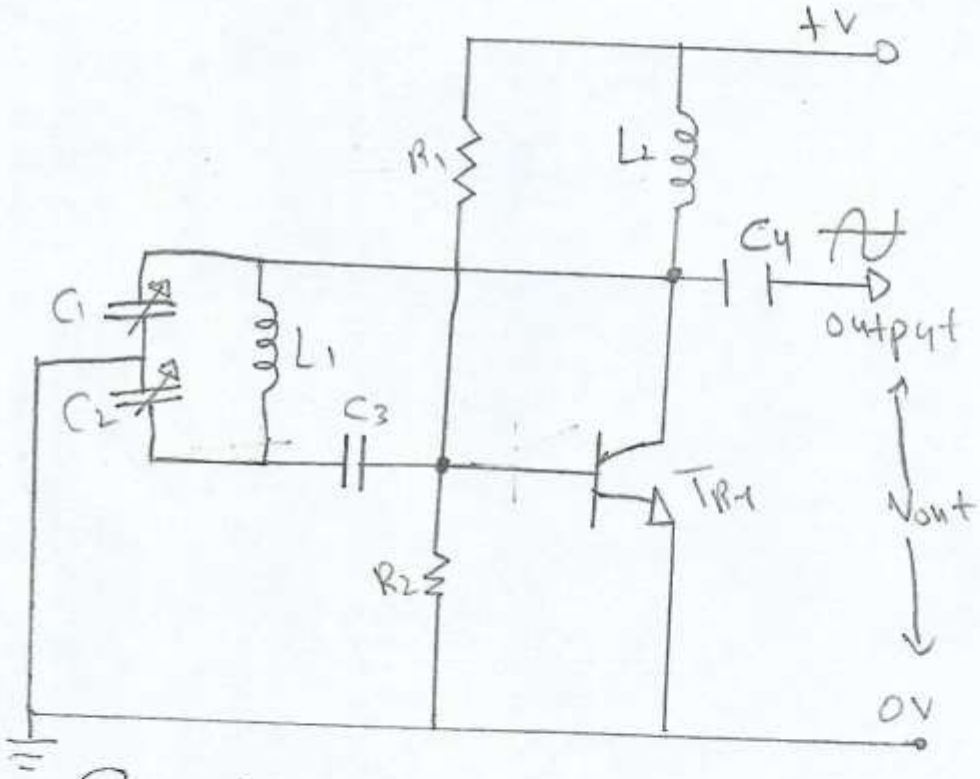
Intro to Colpitts Oscillator:-

The Colpittis Oscillator uses two Centre-tapped Capacitor in series with a Parallel inductor to form it's resonance tank circuit producing Sinusiodal oscillation



Colpittis Tank

Basic Colpittis Circuit:-



Circuit Explanation:-

The emitter terminal is connected to the junction of the two Capacitor C_1 & C_2 which are Connected in Series and act as a voltage divider

When Power supply (V_s) applied C_1 & C_2 charges up & discharge through the coil L.

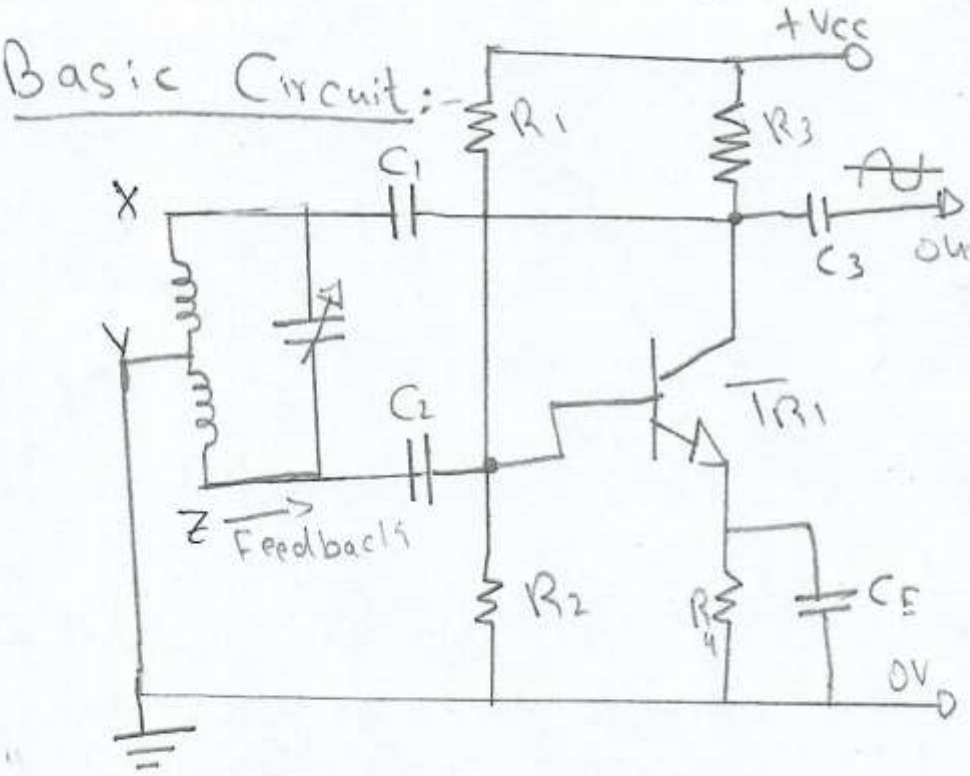
The oscillation across the capacitor are applied to the base-emitter junction and appear in the amplified at collector output

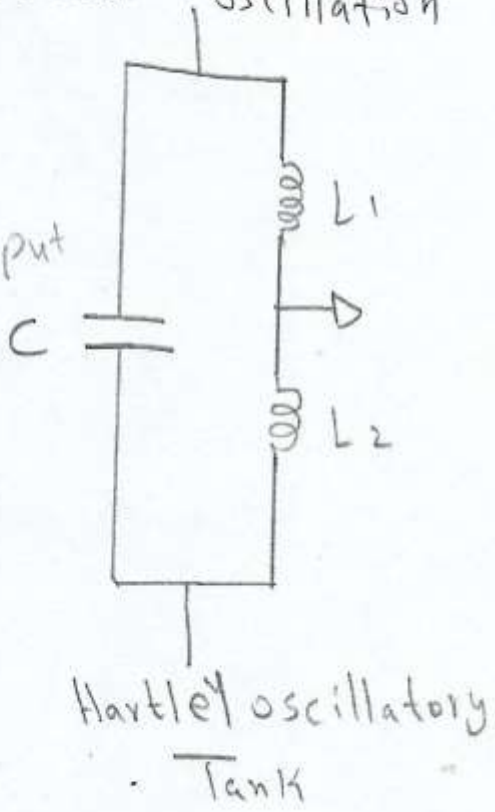
- R_1 & R_2 Provide DC stablizing DC bias for transistor in the normal manner while the additional capacitor act as a DC Blocking
- RFC is used in the collector circuit to Provide high reactance at the frequency oscillation.
- The required tive feedback obtained for sustained undamped oscillation.

The Hartley Oscillator:-

The Hartley Oscillator uses two inductive coils in series with Parallel capacitor to form resonance tank Circuit Producing Sinusoidal oscillation

Basic Circuit:-





Hartley oscillatory Tank

Explanation:- Hartleys Oscillator circuit can be made from any Configuration that uses either a single tapped coil or a Pair of series connected coils in Parallel

When the circuit is oscillating the voltage at Point X (collector). relative to Point Y. emitter is 180° out-of-Phase with the voltage at Point Z (base) relative to Point Y

Thus there is 180° Phase change in the voltage b/w base & collector and this along with the original 180° phase shift in the feedback loop. Provide the correct Phase relation.

The amount of feedback depend upon the Position of the tapping Point of the inductor. If this is moved nearer to the collector the amount of feedback increased.

The frequency of oscillation increased or decreased by tuning capacitor.

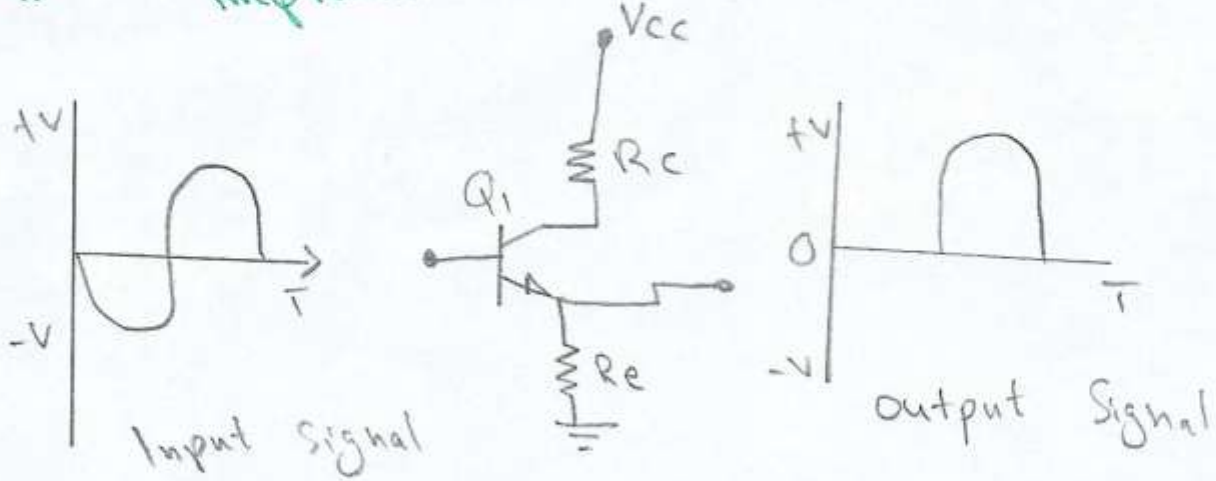
Q3.	(a)	**Describe** the idea behind class B amplifiers.	Marks 06+06

Q3:-

Idea behind class B amplifier:-

Class B amplifier is a type of Power amplifier where the active device (transistor) conduct only for one half cycle of the input signal.

Since the transistor is switched off for half the input cycle, the active device dissipates less Power & hence the efficiency is improved.



It is clear from the circuit that the base of the transistor Q1 is not biased and the -ive half cycle of waveform is missing in output. It improves Power efficiency it creates a lot of distortion

input will be available in the output and that is bad thing.

	(b)	**Explain the** types of voltage regulators and their purposes.	CLO 2

b) Types of Voltage Regulators:-

- Linear Voltage Regulator
- Switching Voltage Regulator

Linear Voltage Regulator:- If the transistor stays in active region or ohmic region or linear region during voltage regulation then the regulator is called Linear voltage regulator when a load is connected, the changes in either input or load will result in a variation in current through the transistor so that the output is maintained constant for the transistor to be able to vary its current (collector-emitter current in case of BJT) it must be operated in ohmic region.

During this Process the regulator wastes a lot of power as the net voltage

Classified into five categories

Positive Adjustable Regulator
Negative Adjustable Regulator
fixed output Regulator
Tracking Regulator
floating Regulator

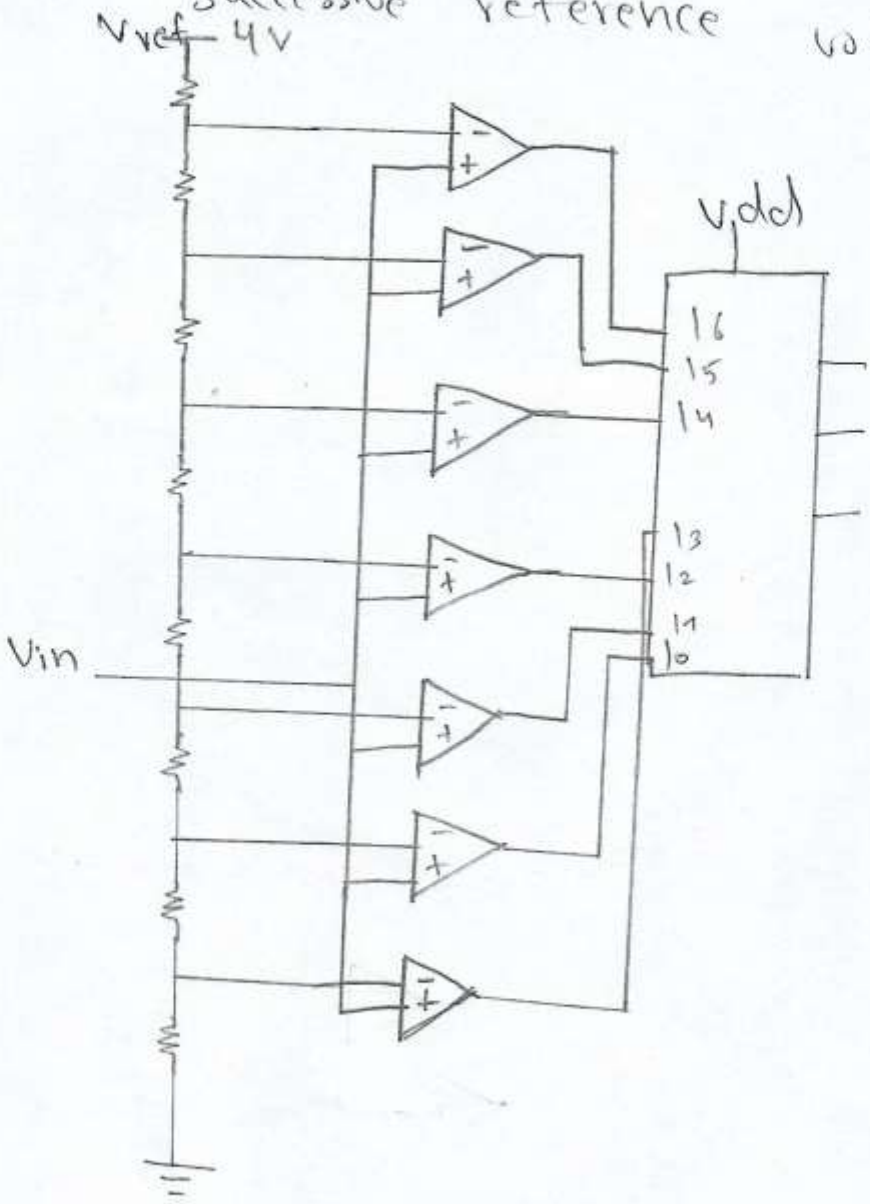
Switching Voltage regulator:- When the transistor operates in cut off state & Saturation State i.e it switches b/w off state & Saturation state, then the regulator called Switching voltage regulator.

Switching regulator operates different than the Linear Regulator in the sense that the Pass transistor acts as a switch it stays in ON state & off state.

Q4.	**Explain** the working of Flash ADC.	Marks 05
		CLO 2

Flash ADC :-

A flash ADC is a type of Analog-to-digital converter that uses a linear voltage ladder with a comparator at each "rung" of the ladder to compare the input voltage to Successive reference voltage.



flash ADC (Analog to Digital converter)

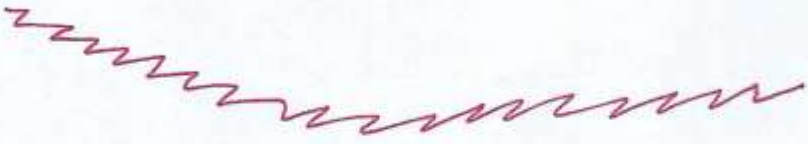
The comparator output connected to the input of a Priority encoder which then Produce a binary output

Vref is a steady reference voltage Provided by a Precision voltage regulator

As the analog input voltage exceeds the reference voltage at each comparator the comparator state. Sequentionally saturate to a high

Analog input

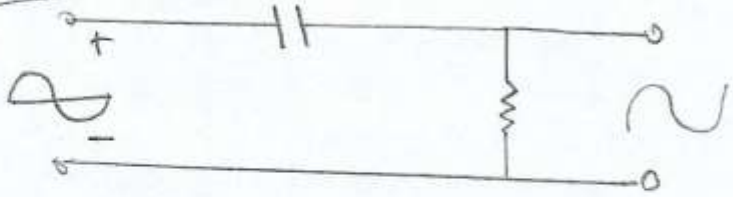
Digital outp



Q5.		**Differentiate** between the following:	Marks
	(a)	Low pass & high pass filters	04+04
	(b)	Active and passive filters	CLO 2

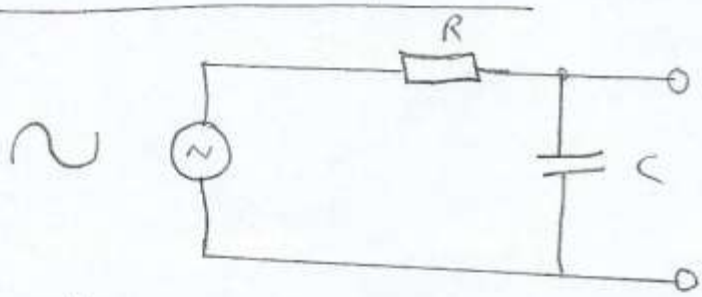
Difference b/w Low Pass & High Pass filters :-

High Pass filter :-



It allows only high frequencies to pass through it while blocking low frequencies.

Low Pass filter :-



It allows only low frequecies to Pass through it and blocks high frequencies.

Passive & active filters:-

Passive filter :- It include only passive components such as resistors, capacitors, inductors Passive filters are most responsive to a frequency range from roughly 100Hz to 300MHz The limitation on the lower end is a result of the fact that at low frequecies the inductance or capacitance would have to be quite large.

Active filter:- Active filter's deals with very low frequencies (0 Hz) and they can Provide voltage gain (Passive filter cannot) Active filter are used to design high order filters with out the use of inductors Active filters are less suitable for high frequencies.