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

Course Details

Course Title: Electronic Circuit Design **Module:** 04
Instructor: _____ **Total Marks:** 50

Student Details

Name: _____ **Student ID:** _____

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
	(a)	Low pass & high pass filters	04+04
	(b)	Active and passive filters	CLO 2

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Course Title: Electronic circuit design Module: 4th

Instructor: eng Mujtaba Insan Sir Date: 24/06/2020

Department: electrical Engineering

QNo1a):- Dicuss the darlington connection for multistage amplifiers.

Ans:- The main feature of Darlington connection of amplifiers is that the composite transistor acts as a single unit with a current gain that is the product of the current gains of the individual transistors it provides high current gain than a single BJT.

The connection is made using two separate transistors having current gains of B_1 and B_2.

So the current gain is

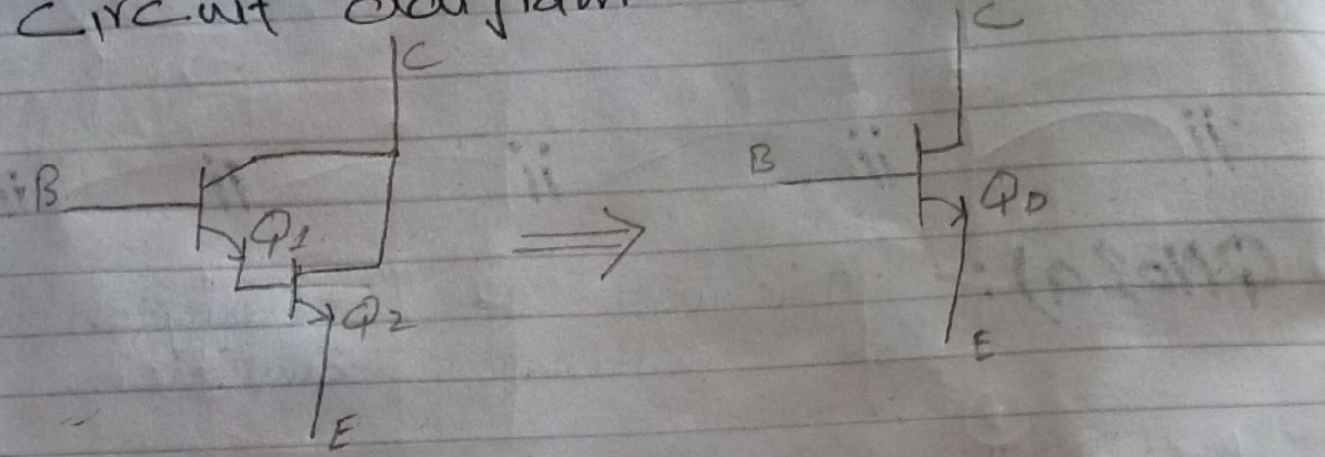
$\beta_D = \beta_1 \beta_2$

If $\beta_1 = \beta_2 = \beta$

The Darlington connection provides a current gain of

$\beta_D = \beta_2$.

Circuit diagram:-

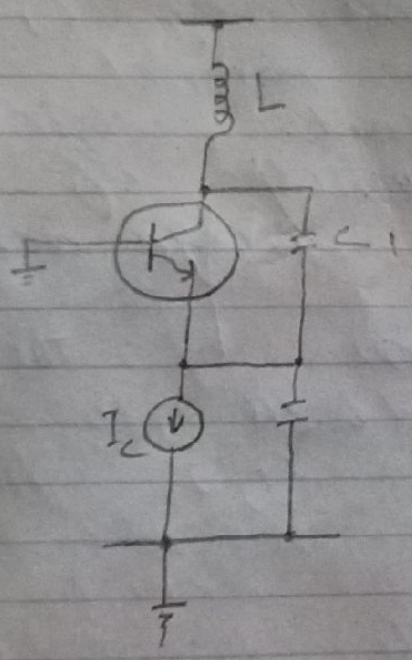


QNo 2:- Explain Colpitts and Hartley oscillators.

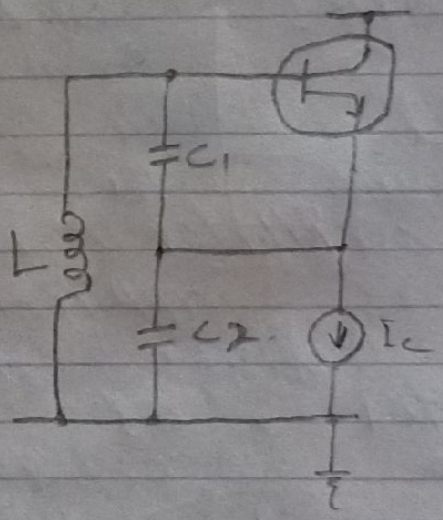
Colpitts oscillators:-

A colpitts oscillator is one of the electronic oscillator that use combination of inductor (L) and a capacitor (C) to create a feedback loop. It is named after its inventor, Edwin H. Colpitts, who was an American engineer. The colpitts oscillator was invented in 1918 by the engineer Edwin H. Colpitts. it is a number of designs for LC oscillator.

and capacitor (C) to produce an oscillation at a certain frequency. The distinguishing feature of the colpitts oscillator is that the feedback for the active device is taken form a voltage divider made of two capacitors in seriese across the inductor.



common-base colpitts biasing oscillator



common collector colpitts oscillator.

The colpitts circuit, like other LC oscillators consist of a gain device with its output connected to its input in a feedback loop containing a parallel LC circuit which function as a band pass filter

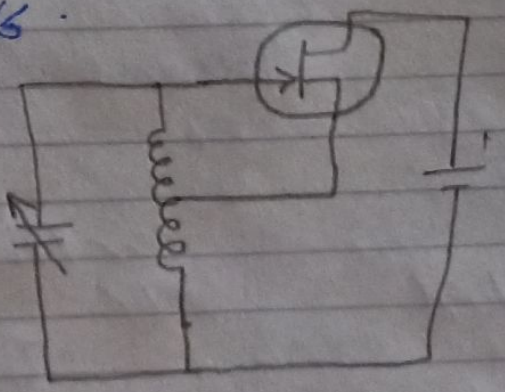
to set the frequency of oscillation.

A colpitts oscillator is the electrical dual of a Hartley oscillator, where the feed back signle is taken from an inductive voltage divider consisting of two coil in series. L and the series combination of C_1 and C_2 form the parellel resonant tank circuit. which determine the frequency of the oscillator. the voltage across C_2 is applied to the base emitter junction of the transistor, as feedback to create oscillations. fig2 show the common - collector version. Here the voltage across C_1 provides feed back. The frequency of oscillation is approximately the resonant frequency of the LC circuit, which is the series combination of the two capacitors in parellel with the inductor.

$$f_0 = \frac{1}{2\pi\sqrt{L\frac{C_1C_2}{C_1+C_2}}}$$

Hartley oscillator:-

The Hartley oscillator is an electronic oscillator circuit in which the oscillation frequency is determined by a tuned circuit consisting of capacitor and inductors, that is an LC oscillator. The circuit was invented in 1915 by American engineer "Ralph Hartley. The distinguishing feature of the Hartley is that the tuned circuit consists of a single capacitor in parallel with two inductors in series, and the feed back signal needed for oscillation is taken from the center connection of the two inductors.



The Hartley oscillator is distinguished by tank circuit consisting of two series connected coils in parallel with a capacitor, with

an amplifier between the relatively high impedence across the entire LC tank and the relatively low voltage / high current point between the coils.

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QNo3a):-

Describe the idea behind class B amplifiers.

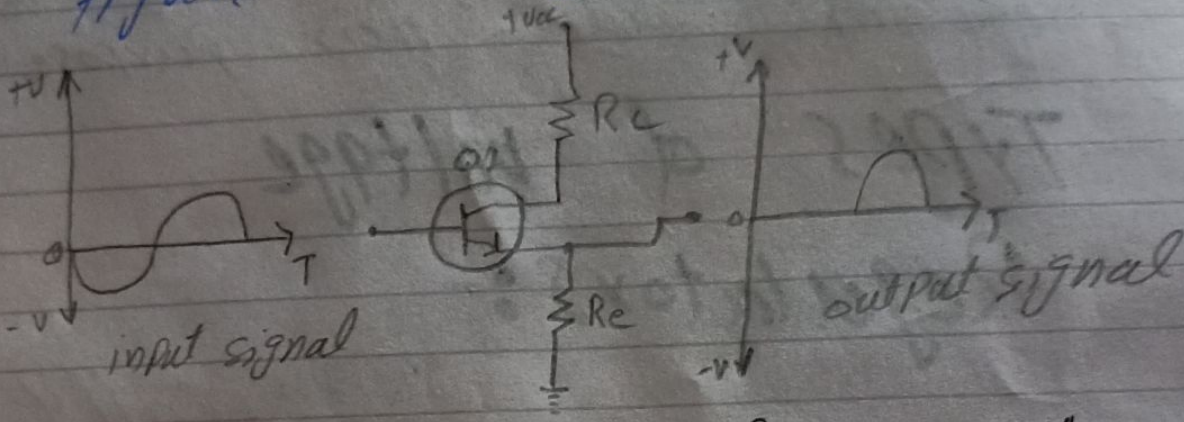
Ans:-

Class B Amplifier:-

Class B amplifier is the type of power amplifier where the active device (transistor) conducts only for one half cycle of the input signal. That means the conduction angle is 180° for Class B amplifier.

Since the active device is switched off for half the input cycle, The active device dissipates less power and hance the efficiency is improved. The theoretical maximum efficiency of class B power amplifier is 78.5%. The schematic

of a single ended class B amplifier and waveforms in the input, output are shown below.



single ended class B amplifier.

From the above circuit it is clear that the base of the transistor Q1 is not biased and the negative half cycle of the input waveform is missing in the output. Even though it improves the efficiency it create a lot of distortion. only half of the input information is present in the output with bad thing. Single ended class B amplifiers are not used in present day practical audio

amplifier application.

Q No3 b):- Explain the types of voltage regulators and their purpose.

Ans:- **Types of voltage Regulators:-**

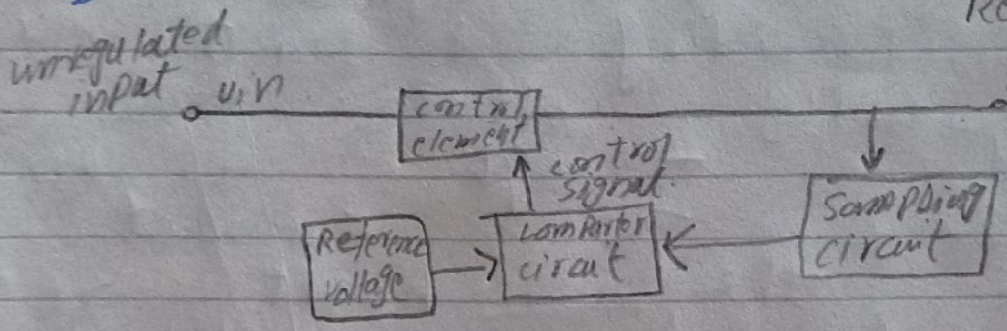
There are basically two types of voltage regulators. The one is linear and the other one is switching voltage regulator. There are two types of series regulator and shunt.

Linear Regulators:-

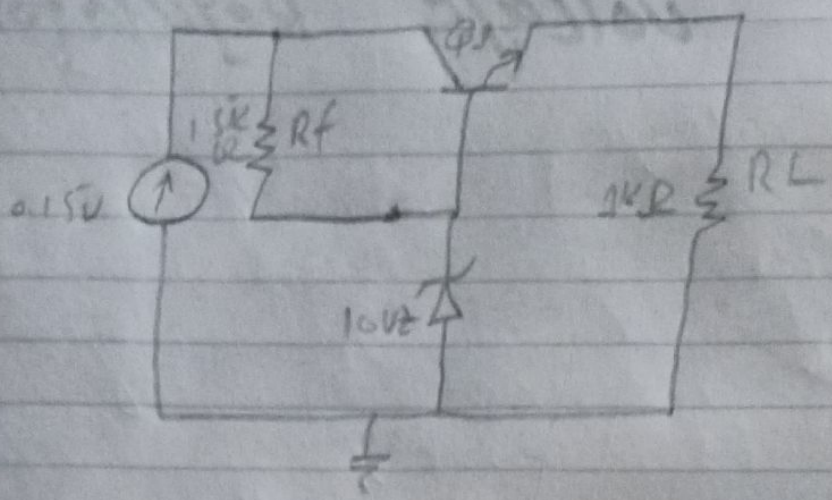
Linear voltage regulator act as the ohmic divider region. In it the FET uses resistance of the regulator which varies with the voltage resulting constant load output voltage.

Series voltage Regulator:-

A series voltage regulator is a variable series element with changing of element, across the load voltage remain constant.



The amount of current drawn is effectively used by the load. This is the main advantage of series voltage regulator. Even the load requires current, series regulator does not draw full current. There is considerably less current. Than shunt series regulator.



Shunt voltage Regulator:-

A shunt voltage regulator works by Providing a path from the supply voltage to ground through a variable resistance. The current through the shunt regulator has diverted away from the load and flows uselessly to the ground. it is, however simpler sometimes consisting of just a voltage-reference diode and is used in very low powered circuits where in the wasted current is too small to be of concern.

* Shunt regulators are used in low output voltage switching

power supplies.

* Current source and sink circuits
* Error amplifiers.
* voltage monitoring etc.

Switching voltage regulator:-

A Switching regulator rapidly switches a series device on and off. The switch's duty cycle sets the amount of charge transferred to the load. This is control by a similar feed back mechanism to that do a linear regulator. Switching regulator are efficient because the series element is either fully conducting or switched off almost no power. Switching regulator are able to generate output voltages that are higher than the input voltage or of opposite polarity, unlike linear regulator.

Q No 1 b):- The input of a certain regulator increase by 4.5 V. As a result the output voltage increase by 0.062 V. The nominal output is 40 V. Evaluate the line regulation in both % and in %/V

Sol:-

$$\text{Line Reg} = \frac{0.062}{4.5} \times 100\%$$

$$= 1.377\%$$

Ep

$$\text{Line Reg} = \frac{\frac{0.062}{40}}{4.5} \times 100\%$$

$$= 0.034\%/V$$

ii ii ii ii

Q No 4:- Explain the working of Flash ADC.

Ans: **Flash ADC:-** series of

comparators, each one compares input to a unique reference voltage. comparator outputs connect to a priority encoder circuit.

working of Flash ADC:-

As the analog input voltage exceeds the reference voltage at each comparator, the comparator outputs will saturate to a high state. The priority encoder generates a binary number based on the highest order active input, ignoring all other inputs.

Q NOS:- Differentiat between the following.

9):- Low pass & high pass filters:-

The difference between low pass filter and high pass filter mainly includes definitions, circit architecture, significance, operating frequency and application.

Low pass filter	high pass filter
Low pass filter allows the frequency underneath cut-off frequency for flowing through it.	high pass filter allows the frequency over cut-off frequency for flowing through it.
it can be built with a resistor which is followed by a capacitor.	it can be built with a capacitor which is followed by a resistor.
it is important in eliminating the aliasing effect.	it is important whenever the distortion occure because of low-frequency signal like noise to be detached.
it is less than the cut-off frequency	it is higher than the cut-off frequency.
The LPF can be used as an anti-aliasing filter in communication circuit.	The HPF can be used in amplifire like low noise, audio, etc.

b) Difference B/w Active & passive Filter.

The major difference between active and passive filter is that an active filter uses active components like transistor and op-amp for the filtering electronic signals. As against, a passive filter uses passive component like resistor, inductor and capacitor. to generate a signal of a particular band.

Comparision chart.

Basis of comparision	Active filter	Passive filter.
composed of	Active component like ~~resistor inductor etc~~ transistor etc.	Passive component like resistor inductor etc
cost	high	comparatively low.
circuit	more complex	less complex than active filter.