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Subject Electronics Circuit Design

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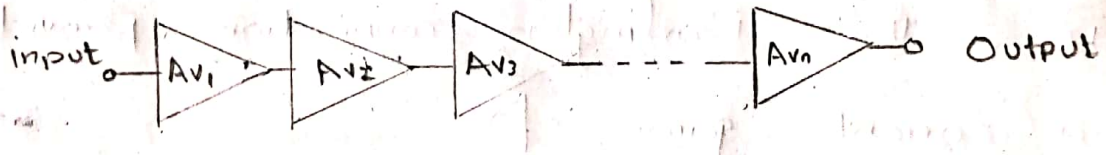
Ans 01(a)

Multistage Amplifiers:-

Two or more amplifier can be connected to increase the gain of an ac signal The overall gain can be calculated by simply multiplying each gain together

$$A'_v = A_{V_1} A_{V_2} A_{V_3} \ldots$$

Multistage amplifier are amplifier circuits cascaded to increased gain. We can express gain in desibels (dB)



Darlington Connection:-

The main features is that the composite transister acts as a single unit with

a current gain that is the product of the current gains of the individual transistors.

Provides high current gain than a single BJT

The connection is made using two separate transistors having current gains β_1 of and β_2

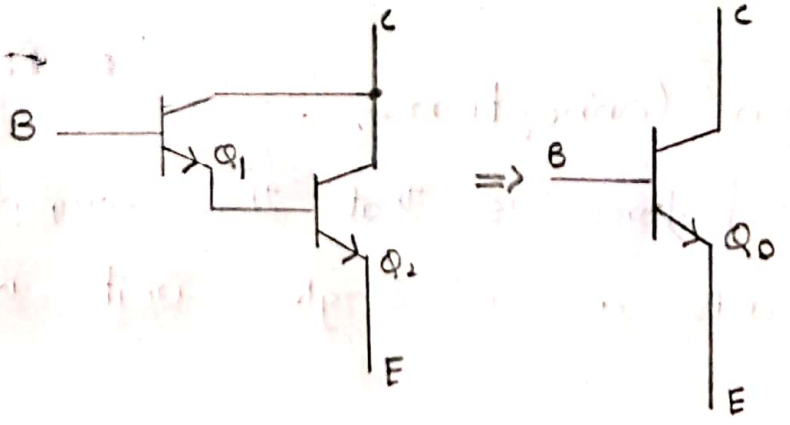
So the current gain

$$\beta_D = \beta_1 \beta_2$$

$$\beta_1 = \beta_2 = \beta$$

if the Darlington connection provides a current gain, of

$$\beta_D = \beta^2$$



Darlington Transister

Ans 1(b)

Solution:

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

$$= 1.377\ \%$$

and

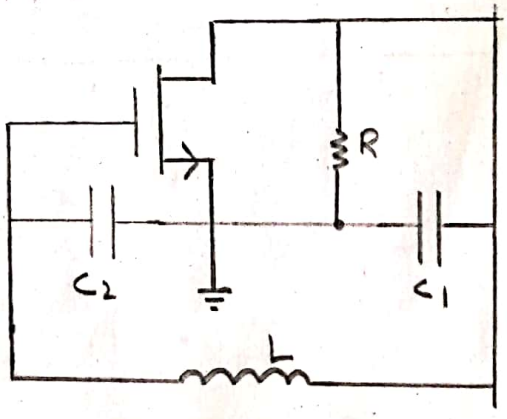
$$\text{Lin Reg} = \frac{0.062}{\frac{4.0}{4.5}} \times 100\%$$

$$= 0.034\ \%V$$

Ans 2

Colpitts Oscillator :-

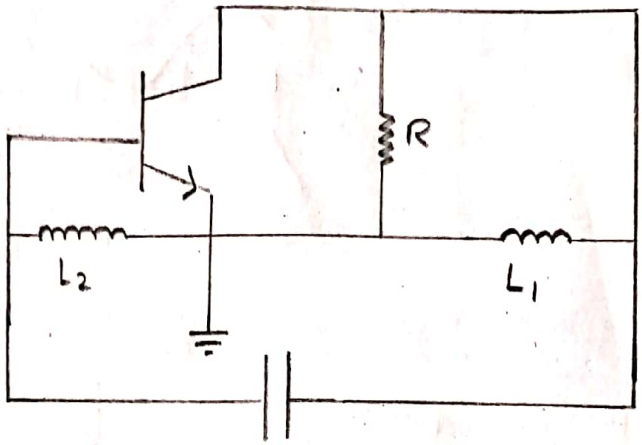
- The Colpitts Oscillator is a type of oscillator that uses an LC circuit in the feedback loop.
- The feedback network is ~~back~~ made up of a pair of tapped capicitor (C_1 & C_2) and an inductor L to produce a feedback necessary for oscillations.
- The output voltage is developed across C_1
- The feedback voltage is developed accross C_2.



Hartley Oscillator:

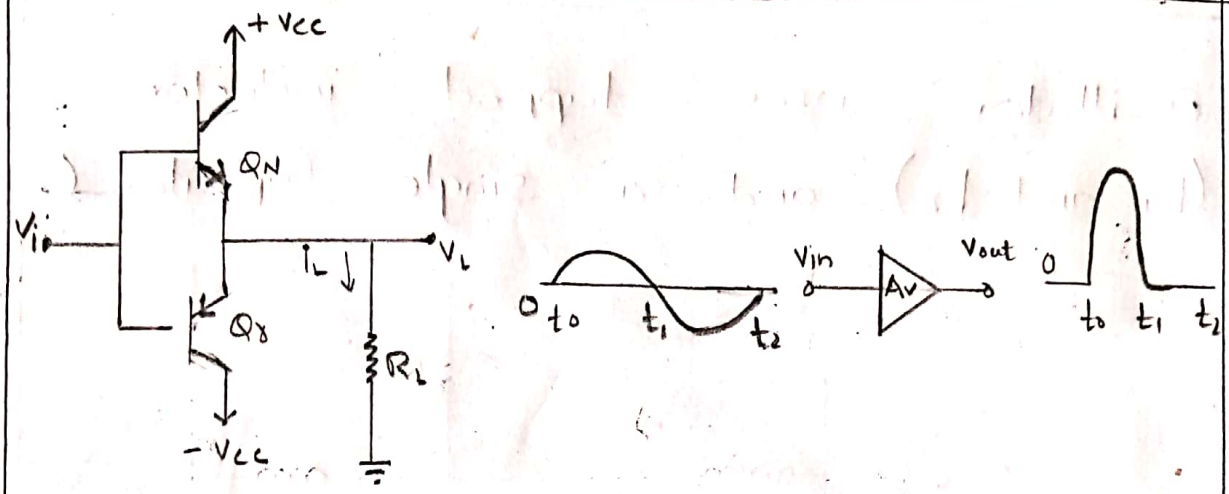
- The Hartley Oscillator is almost identicle to the colpitts Oscillator.
- The primary difference is that the feedback network of The Hartley

Oscillator uses tapped inductor (L_1 and L_2) and a single capicitor (.



Ans 3(a) Power Amplifier (lasses "B"

- Opposite of class A: A both output devices are never allowed to be on at the same time
- Each output device is on for exactly one half of a complete sinosoidal signal cycle.
- Class B design show high efficiency but poor linearity around the crossover region due to the time it takes to turn one device off and other device on.
- Class B-design restricted to low power application, e.g battery operated equipment such as communication Audio.

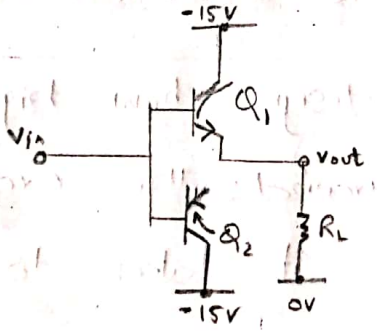


Class B output stage

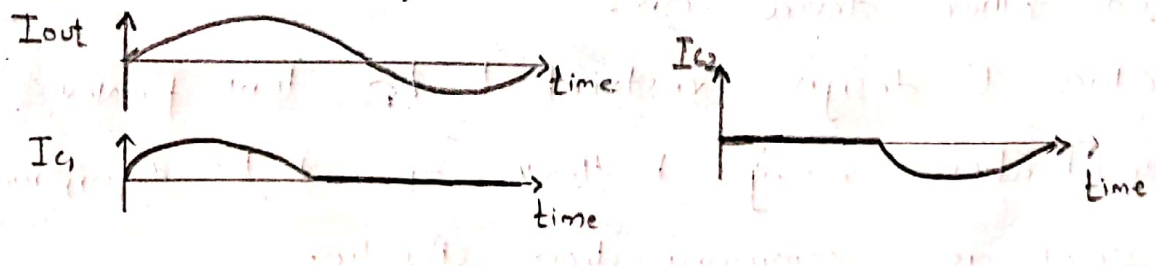
Circuit Operation:

Class B Output Stage:

- Q_1 and Q_2 form two unbaised emitter followers.
- Q_1 only conducts when input is positive.
- Q_2 only conducts when input is negative.
- When input is zero, neither conducts.
- i.e the quiescent power dissipation is zero



Class B Current Waveform:



Efficiency/Power Dissipation:-

- Peak efficiency of class B output stage is 78.5% much higher than class A.
- Unlike class A, power dissipation varies with output amplitude.
- Remember, there are two output devices so the power dissipation is shared between them.

Class B:-

- A class B output stage can be far more efficient than a class A stage (78.5% maximum efficiency compared with 25%.
- It also requries twice as many output transistors and it is not very linear cross-over distortion can be significant.
- Class B amplifiers are used in low cost designs or designs where sound quality is not that important.
- Class B amplifiers can be significantly more efficient then class A amplifiers.
- Class B is used most often where economy of design ~~are~~ is needed
- Before the advent of IC amplifiers, class B amplifier were common in clock radio circuits, Pocket transister Radio, or other applications.

Ans 3(b)

Types of voltage Regulation:-

There are two basic categories of voltage regulation:-

① Line Regulation

② Load Regulation

- The purpose of line regulation is to maintain a nearly constant output voltage when the input voltage varies.
- The purpose of load regulation is to maintain a nearly constant output voltage when the load varies.

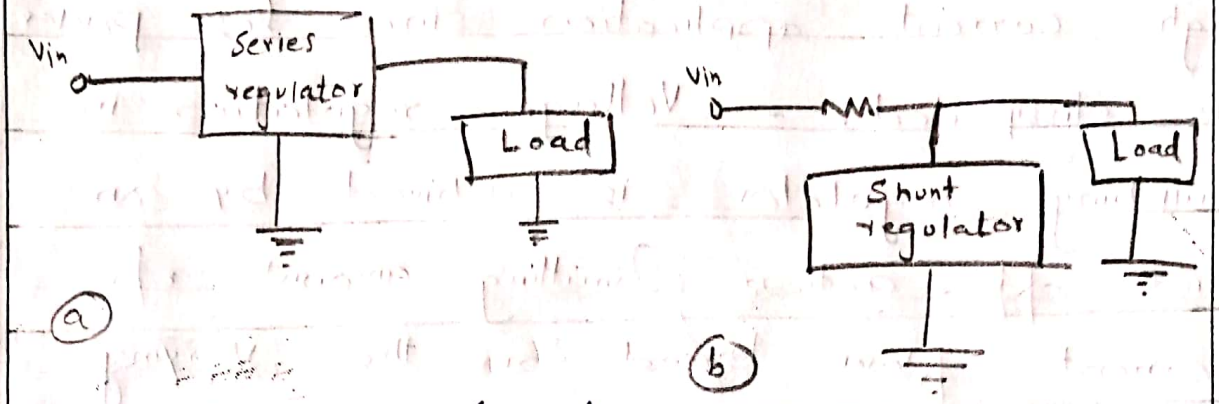
Types of Voltage Regulator

① Linear Regulators:

② Switching Regulator:

- Two Basic types of linear Regulator are series regulator and the shunt regulator.
- The series regulator is connected in series with the load and shunt regulator is connected in parallel with load.

Ans
3 (b)



(a) (b)

Series Regulator Circuit

- Control element in series with load between input and output. - Output sample circuit senses a change in output voltage. - Error detector compares sample voltage with reference voltage.

Transister Shunt Regulator:-

Resister Rs drops the unregulated voltage depending on current supplied to load RL. Voltage across the load is set by zener diode and transister base-emitter voltage. load current, I_L is larger maintaing the regulated voltage across load.

Switching Regulator:-

The switching regulator is more efficient than the linear series or shunt type. This type of regulator is ideal for

high current application since less power is dissipated. - Voltage regulation in switching regulator is achived by on and off action limitting amount of current flow based on the varying line and load condition.

With switching regulators, 90% effiency can be achieved.

Ans 4

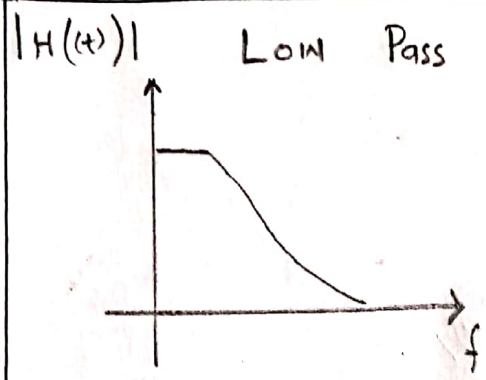
Flash ADC:-

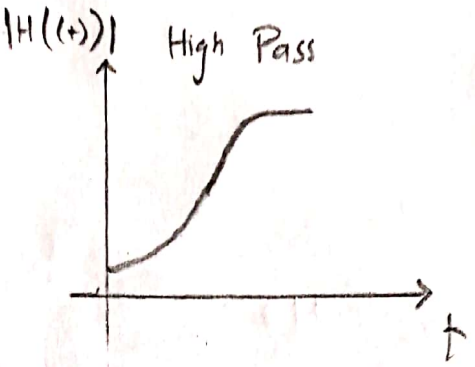
Series of comparators, each one compare input to a unique reference voltage.

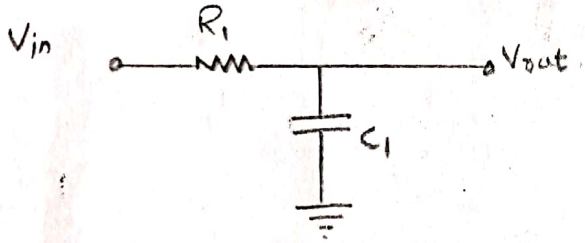
- Comparators Output connect to priority encoder circuit produce binary circuit

Working of Flash ADC:-

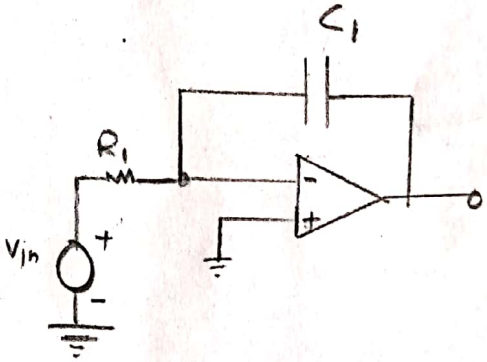
- As analog input voltage exceed the reference voltage ed each comparator, the comparator outputs with sequentially saturate to a high state.
- The priority encoder generator a binary number based on the highest-order active input, ignoring other active inputs.







Passive



Active

The ~~mag~~ major difference between low pass and high pass filter is range of frequency which they pass. If we talk about high pass filter so it is a circuit which allows high frequency to pass filter in an electronic circuit which allows frequency to pass through it.

Comparision Chart:-

High Pass filter:-

It is a circuit which allow the frequency ~~about~~ above cut off frequency to pass through it.

Circuit Architecture :- It consist of capacitor followed by resister.

Significance:- It is significant when distortion due to low frequency signal such as noise is to removed.

Operating frequency:- Higher than cutoff frequency

Applications:- In audio amplifier, low noise amplifier etc.

(a) Low Pass filter:-

It is circuit which allow frequency below cutup frequency to pass throughit

It consist of resistor followed by capacitor.

It is significant in removing aliasing effect.

Lower than cutoff frequency

In communication circuit as antialising filter.

(b) Comparision chat :-

Basis for comparision:-	Active Filter	Passive Filter:
Composed of	Active components like opamp transister	Passive Components ~~Comparitively low~~ like resister, inductor
Cost	High	Comparitively low
Circuit Complexity	More complex	Less complex
Weight	Low	comparatively bullier due to presence of inductors
Q. factor	High	vary Low
Sensitivity:	More Sinsitive	Less sensitive.