Course : Electric circuit design

Module : 4th

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Q1

Part (a) :-

Discuss the darlington Connection for multistage amplifiers.

Ans :-

Investigate another types of the multistage amplifiers designed using simple BJT amplifier circuit, which are current mirror Connection and Darlington Connection practically and Simulation.

Introduction :-

We see two types of Connections that the main function of it amplified the input voltage Signal Av.

Now in this experiment we will see another two Connection that the main function of its amplified the current Ai which are:

* Darlington Connection
* Current mirror Connection.

* Darlington Connection:-
we can construct this type of multistage connection by connect two BJT. it will be operate as one transistor. which called Darlington transistor.
main features of it is that the composite acts as a single unit with a current gain that is equal the product of the current gain of the individual transistor, so it has high current gain in AC and DC.
where βD is the current gain of the Darlington amplifier
βI is the current gain of the first transistor and
$\beta 2$ is the current gain for the second transistor.
In this experiment we interested on how we can amplify the current gain. without voltage gain so we will use the emitter follower amplifier configuration because

it has voltage gain equal one and the circuit of darlington emitter follower amplifier.

the resistance of the base for darlington RB must be high enough to protect from high current that pass through base pain of darlington.

the connection is made using two separate transistor having current gain of

β_1 and β_2

So the current gain.

$$\beta_D = \beta_1 \beta_2$$

if $\beta_1 = \beta_2 = \beta$ $= \beta_D = \beta^2$.

Cl 1 :-

Part 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 40v. Evalute the line regulation in both % and in %/v.

Solutions:-

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

$$= 1.377\%$$

and

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

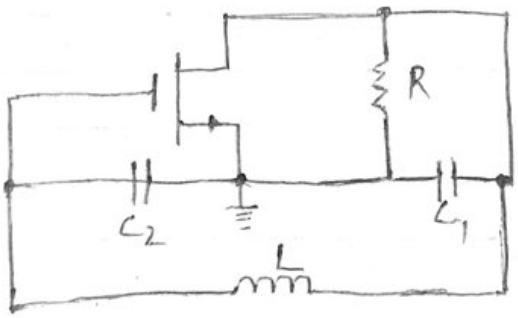
$$= 0.034\%/\text{v},$$

Q 2
Explain Colpitts and Hartley oscillators.

Ans:-

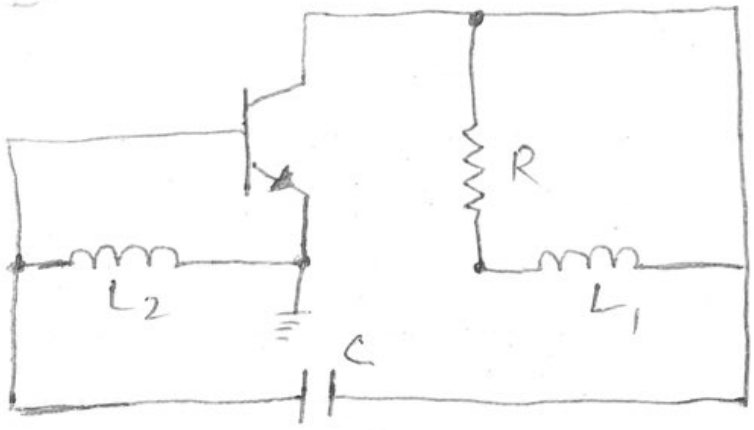
* Colpitts Oscillator:-

- The Colpitts oscillator is a type of oscillator that uses an LC circuit in the feed-back loop.
- The feedback network is made up of a pair of tapped capacitors (C_1 and 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 across C_2.



* Hartley Oscillator:-

- The Hartley oscillator is almost indentical to the ~~Copti~~ Colpitts oscillator.
- The primary difference is that the feedback network of the Hartley oscillator uses tapped inductors (L_1 and L_2) and a single capacitor C.



Q48- Explain the working of flash ADC.

Ans 8-

Working principle of flash ADC:-

Analog voltage is applied to non inverting terminals of all Comparators using a single line. Reference voltage is applied to inverting terminals of Comparators using divider circuit.

Each Comparator produces digital output in the form of 1 or 0. if unknown analog voltage is greator than reference voltage is less than reference voltage then Comparator produces low logic e.g = 0.

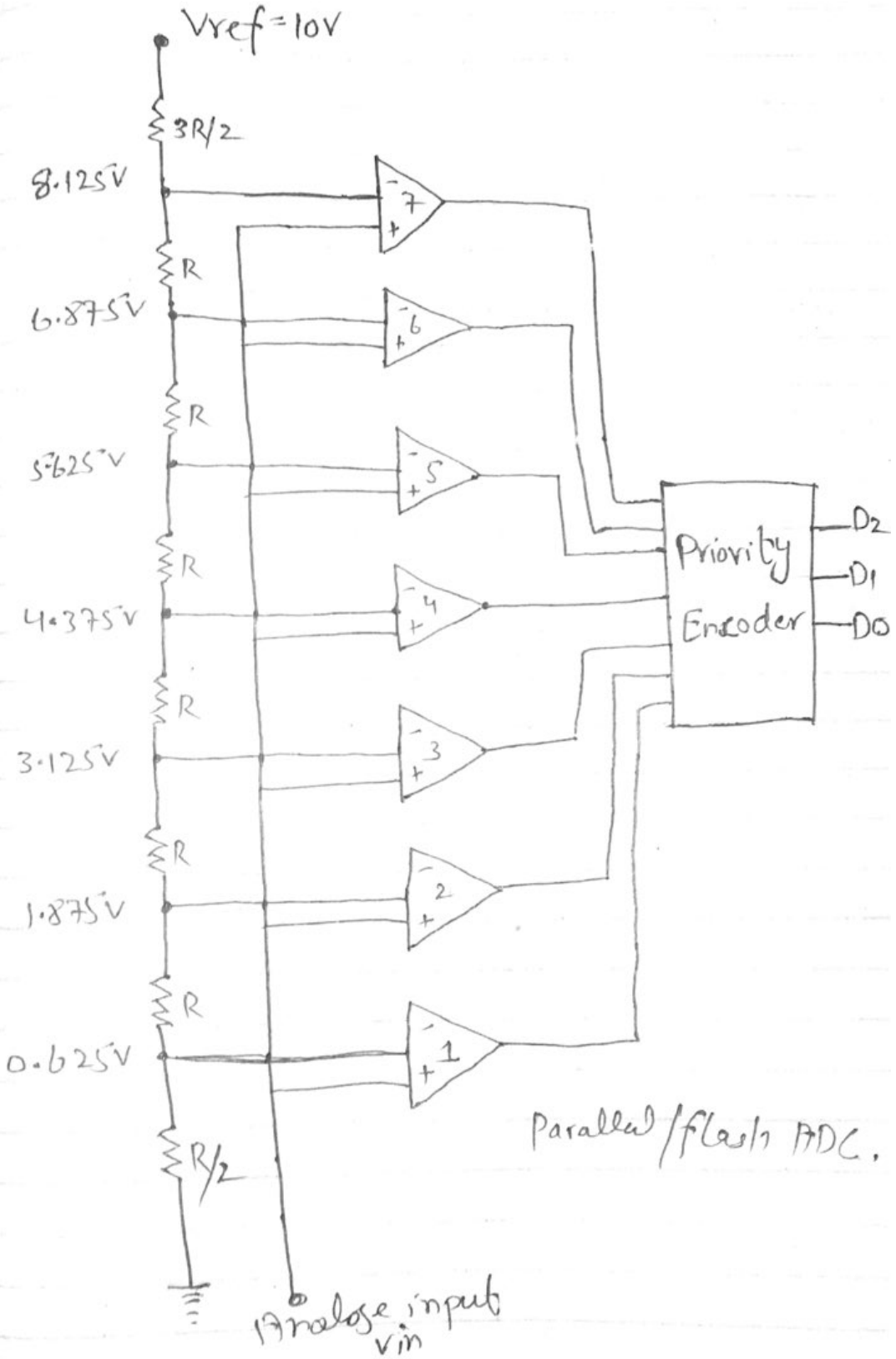
Thus all parallal Comparator produces digital representation of analoge in the form of

Zero and one. These outputs of Comparator are then ~~and~~ applied to the fast encoder. Encoder converts those zeros and ones into binary number and produces digital binary output.

* Flash ADC or Parallal ADC and its working principle :-

Another type of ADC is parallal ADC. Parallal ADC is called as flash ADC. its responce is very fast. it converts analog ~~Singno~~ Signal into digital Signal using parallel set of Comparator. As its Conversion time is very fast it is called as flash ADC.

Daigram :-



Parallel / flash ADC.

Q S:-

Part A:-

Difference between Low pass filter and High pass filter.

Low Pass filter	High pass filter.
* LPF circuit allows the frequency underneath Cut-off frequency for following through it	HPF circuit allows the frequencies over cut-off frequency for following through it.
* it can be built with a resistor which is followed by a Capacitor.	it can be built with Capacitor which is followed by a resistor.
* it is important in eliminating the aliasing effect.	* it is important whenever the distortion occurs because of low frequency signal like noise is to be detached.

* it is lesser 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 amplifier like low noise audio etc.

Qs Part (B):-

* Active and passive filters Differentiate.

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

Basis for Comparison	Active filter	Passive filter.
Composed of	Active Components like opamp transistor etc.	Passive Components like resistor inductor and Capacitor etc.
cost	High	Comparatively low
Circuit Complexity	more Complex	less Complex then active filter
weight	Low	Comparatively bulkier due to presence of inductor
Q factor	high	very low in Comparison to active filters.
External Power Supply	Required	Not Required.
Sensibility	more Sensitive	Comparatively less sensitive.

Q3:-

Part A:-

Describe the idea behind Class B amplifiers.

Ans:-

When the amplifier is in its quiescent state, (it has no input signal) both transistor are biased at cut-off.

→ When the input is positive Q1 is biased above cut-off. transistor conducts producing a replica of positive input at the output.

→ remains in cutoff when the input is negative.

→ above cutoff, and the transistor Conducts producing a replica of the negative input at the output.

Q3 Part B :-

Explain types of voltage regulators and their purpose?

Ans :-

there are two types of voltage regulators.

(1) Linear voltage regulator.

(2) Switching voltage regulator.

*1 Linear voltage regulator :-

step regulators are these types of regulators in which switches regulators the current supply.

*2 Switching voltage regulator :-

Induction regulators which an induction motor supplies a secondary, continually adjusted voltage to even out current variations in the feeder line.

Purpose of voltage regulators:-

→ it acts as a buffer or protecting components from damager. A voltage regulator is a device with a simple feed-forword design and it uses negative feed back control loops.