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Question = 01 :-
Part :- (b) :-

Solution:-

i) :- Line Reg = $\frac{0.062}{4.5} \times 100\%$

$= 1.37\%$

ii) :- Line regulation in %/V ⇒

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

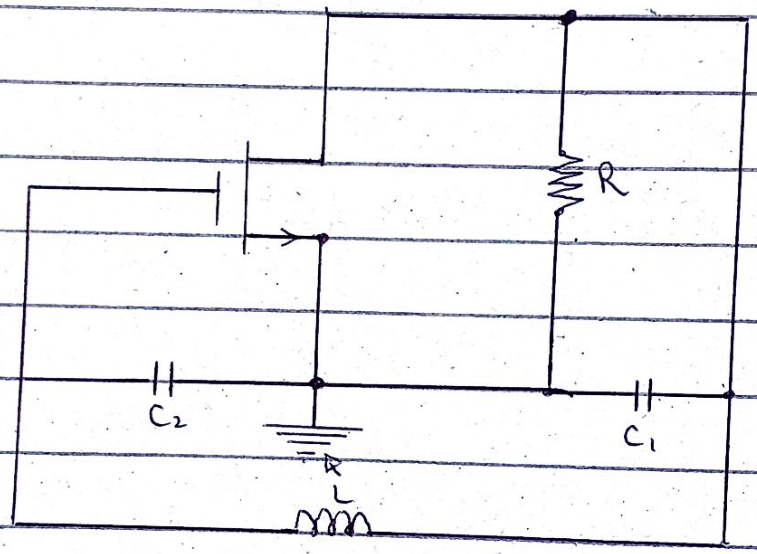
$\Rightarrow 0.034\%/V$

Question = 02:-

Answer:-

Colpitts Oscillator:-

• It is a type of Oscillator that uses an LC circuit in the feedback loop.



• The feedback network is madeup of a pair of tapped capacitor (C_1 and C_2) and an inductor L to produce a feedback necessary for oscillations.

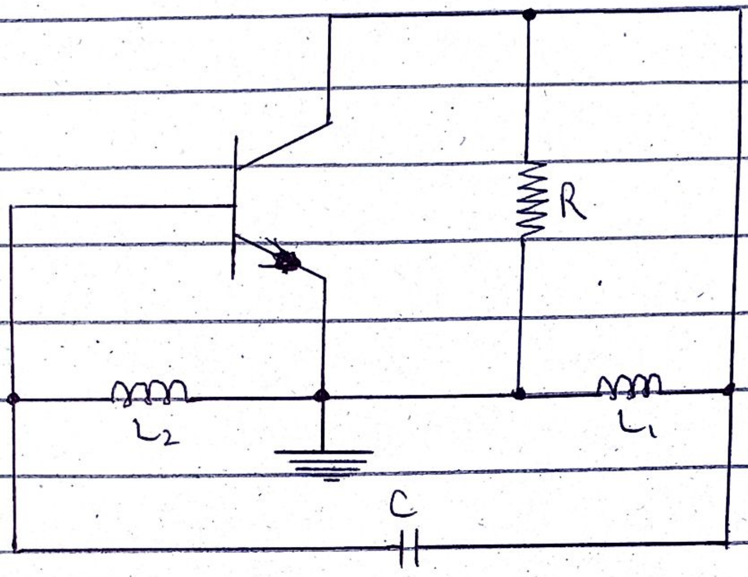
• The output voltage is developed across C_1.

The feedback voltage is developed across C_2.

$$f_t \approx \frac{1}{2\pi\sqrt{LC_T}} \Rightarrow C_T = \frac{C_1 C_2}{C_1 + C_2}$$

Hartley Oscillator:-

It is almost identical to the colpitts oscillator



The primary difference is that the feedback network of Hartley oscillator uses tapped inductors (L_1 and L_2) and a single capacito C.

$Q > 10$

$$f_r = \frac{1}{2\pi\sqrt{L_T C}}$$

$$L_T = L_1 + L_2$$

Question: 3 :-
Part:- (a):-
Answer:-

Class B amplifier:-
→ Opposite of class A both outputs devices are never allowed to be on the same time.
→ Each output divice is on for exactly one half of a complete sinusoidal signal cycle.
→ Its design show high efficiency but poor linearity around the crossover region.
→ Its design is restricted to low power application e.g:- battery.
→ Efficiency:- Peak efficiency of the class B output stage is 78.5% much higher than class A
→ It is used in low cost designs
→ It suffer from bad distortion when the signal level is low.
→ Before the advant of IC amplifier class B amplifier were common in clock radio circuits, Pocket transistor radios, and others where quality of sound is not critical.

Question :- 3:-
Part :- (b):-
Answer:-

Types of voltage regulator:-
There are two types of voltage regulator.
1:- Linear voltage regulator:-
2:- Switching voltage regulator:-

1):- Linear voltage regulators:-
It acts as a voltage divider in a ohmic region. It uses FET. The resistance of voltage regulator varies with load resulting in constant output voltage.
Advantages:-
→ It gives low output ripple voltage.
→ Fast response time to load or line chang
→ Low electromagnetic interference and less noise.
Disadvantages:-
→ It efficiency is low.
→ Requires large space — heatsink is needed.
→ Voltage above the input cannot be increased.

ii):- Switching voltage regulator:-

This regulator rapidly switches a series device on and off. The switches duty cycle sets the amount of charge transfered to load. This is controlled by a feedback mechanism similarly to that of a linear regulator. It is efficient because the series element is either fully conducting or switched off because its dessapates almost no power.

Advantages:-

Its ↑ switched power supply are efficient, size and weight. Its also a more complex design which is capable of hight powe efficiency. It provide outputs, which is greater, less or inverts the input voltage.

Disadvantages:-

→ High output ripple voltage.
→ Slower transient recovery time.
→ EMI produce very noisy output.
→ Very expensive.

Question = 06:-

Solution:-

Given data:-

$A_o l = 400,000$

$A_o m = 0.6$

Required:

CMRR = ?

Solution:-

$$CMRR = A_o l / A_{om} \Rightarrow 400,000 / 0.6$$

$$\Rightarrow 666,666.6$$

Expressed in deciibels:-

$$CMRR = 20 \log (666,666.6)$$

$$\Rightarrow 116.47 \text{ dB}$$

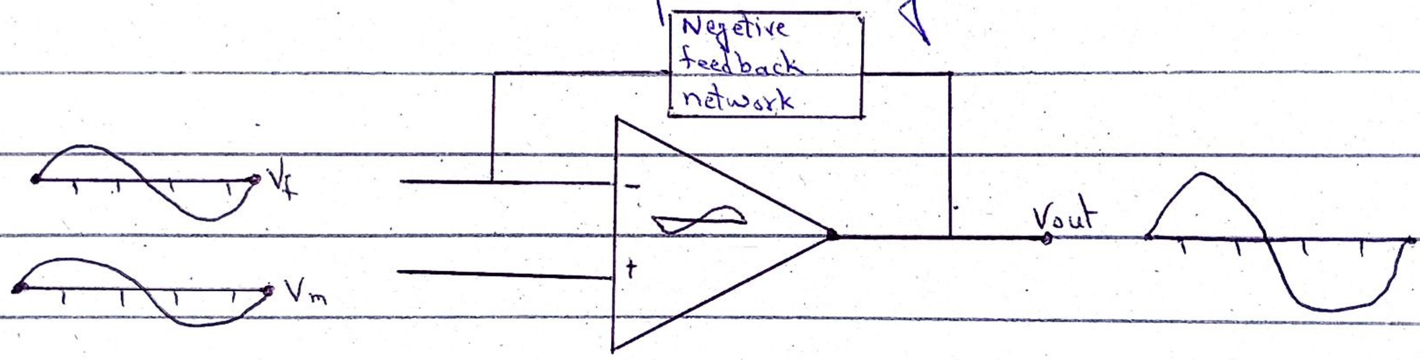
Questions:- 07 :-

Answer:-

Negetive feedback:-

→ It is a process where by a portion of output voltage of an amplifier is returned to the input with a phase angle that opposes the input signal.

→ Inverting (–) inputs effectively makes the feedback signal 180° out of phase with the input signal.



It occurs when some function of the output of a system or mechanism is feedback in a manner that tends to reduce the fluctuations in the output, whether caused by changes in the input or by other disturbance.

Question = 05 :-

Part:- A:-

Low Pass Filter	High Pass Filter
→ Used for smothing image	→ ~~Sha~~ Use for sharping the Image.
→ It attenuates the high frequency	→ It attenuates the low frequency.
→ Low frequency is preserved in it.	→ High frequency is preserved in it.
→ Below cutt off frequency is allowed to pass through it.	→ Above cutt off frequency is allowed to pass through it.
→ Consist of resistor followed by capacitor.	→ Consist of capacitor followed by resistor.
→ It helps in removal of alaising effect.	→ It helps in removal of noise
$G(u,v) = H(u,v).F(u,v)$	$H(u,v) = 1 - H'(u,v)$

Question : 05 :-
Part :- (B) :-

Active Filter	Passive Filter
→ Composed of components like op-amp, transistor etc	→ Composed of component like resistor, inductor etc.
→ Cost is high	→ Its cost is low
→ Its circuit is more complex	→ Less comple than active.
→ Its weight is low.	→ Comparatively high.
→ Q factor is high.	→ Q factor is very low.
→ External power supply is required	→ External power supply is not required.
→ It is more sensetive	→ It is less sensetive

Question:- 04.-

Answer:-

ADC basic principle:-

→The basic principle of operation is to use the comparator principle to determine wether or not to turn on a particular bit of the binary number output.

→ It is typical for an ADC to use a digital to analog converter (DAC) to determine one of the input to the comparator.

Flash ADC:-

• Consist of a series of a comparators eachone comparing the input signal to a unique reference voltage.

• The comparator outputs connect to the input of a priority encoder circuit, which produce a binary output.

How Flash works:-

• As the analog input voltage exceeds the reference voltage at each comparator output will sequentially

Saturate to a high state.

- The priority encoder generates a binary number based on the highest-order active input, ignoring all other active inputs.

Flash Advantages:-

→ Simplest in term of operational theory.

→ Most efficient in term of speed, very fast limited only in term of comparator and gate propagation delays.

Flash disadvantages:-

→ Lower resolution

→ Expensive

→ For each additional output bit, the number of comparator is doubled i-e:- for 8 bits, 256 comparator needed

Question: 01 :-
Part:- (a):-

Darlington Connection:

→ The main feature is that the composite transistor acts as a single unit with a current gain that is the product of current gain of individual transistor provide high current gain then a single BJT.

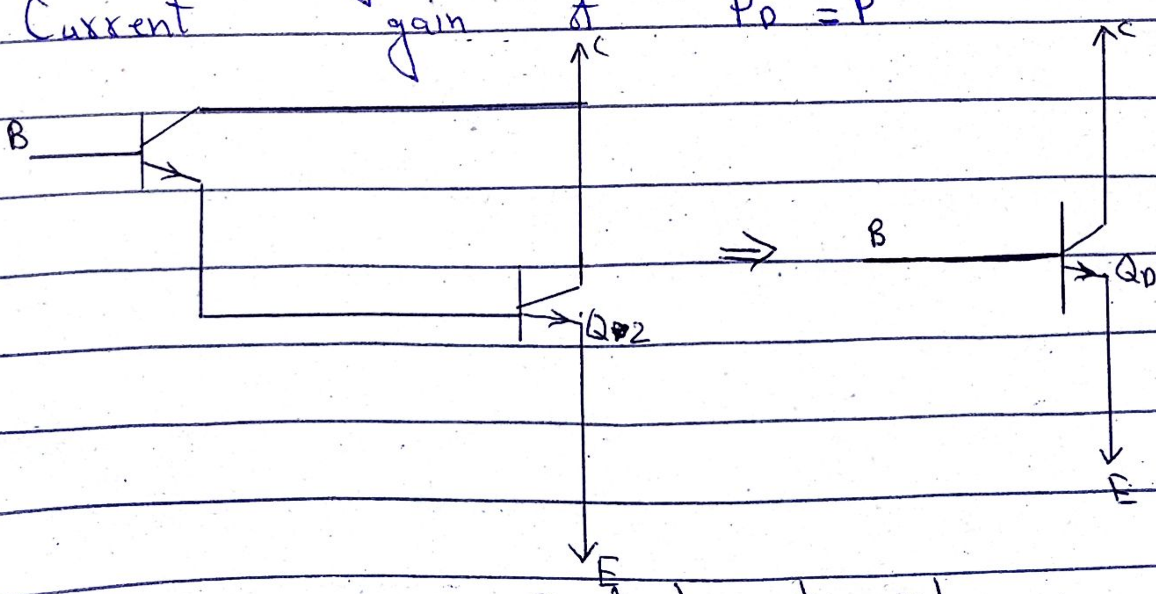
→ The connection is madeup of using two separate transistor having current gain of β_1 and β_2.

So the current gain.

$$\beta_D = \beta_1 \beta_2$$

→ If $\beta_1 = \beta_2 = \beta$

The darlington connection provides a current gain of $\beta_D = \beta^2$



Darlington transistor.

→ The small current gain:-

$$A_i = I_o / I_i$$

Since

$$V_{\pi 1} = I_i \, r_{\pi 1}$$

Therefore

$$g_{m1} V_{\pi 1} = g_{m1} r_{\pi 1} I_i = \beta_1 I$$

Then

$$V_{\pi 2} = (I_i + \beta_1 I_i) r_{\pi 2}$$

The output current is

$$I_o = g_{m1} V_{\pi 1} + g_{m2} V_{\pi 2} = \beta_1 I_i + \beta_2 (1 + \beta_1) I_i$$

→ The overall gain is

$$A_i = I_o / I_i \Rightarrow \beta_1 + \beta_2 (1 + \beta_1) \cong \beta_1 \beta_2$$

The overall small signal current gain = The product of individual current gain.

→ The input resistance:-

$$V_1 = V_{\pi 1} + V_{\pi 2} = I_i r_{\pi 1} + I_i (1 + \beta_1) r_{\pi 2}$$

So the input resistance is

$$R_i = r_{\pi 1} + (1 + \beta_1) r_{\pi 2}$$

The base of Q_2 is connected to the emitter of Q_1 which means that the input resistance to Q_2 is multiplied by factor $(1+\beta_1)$ as we saw in circuit with emitter resistor.

$$r_\pi = \beta_1 V_T / I_C Q_1 \quad \text{and} \quad I_C Q_1 \cong I_C Q_2 / \beta_2$$

$$r_{\pi 1} = \beta_1 \left(\beta_2 V_T / I_C Q_2 \right) = \beta_1 r_{\pi 2}$$

$$R_i = 2 \beta_1 r_{\pi 2}$$

The input resistance tends to be large because of β multiplication.

The End