COURSE TITTLE :-

ECD

INSTRUCTOR :-

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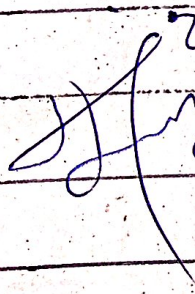


QUESTION NO :- 01 Part (A)

ANSWER :-

DARLINGTON CONNECTION

The main feature 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 provides high current gain than a single bJt.

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

so that the current gain

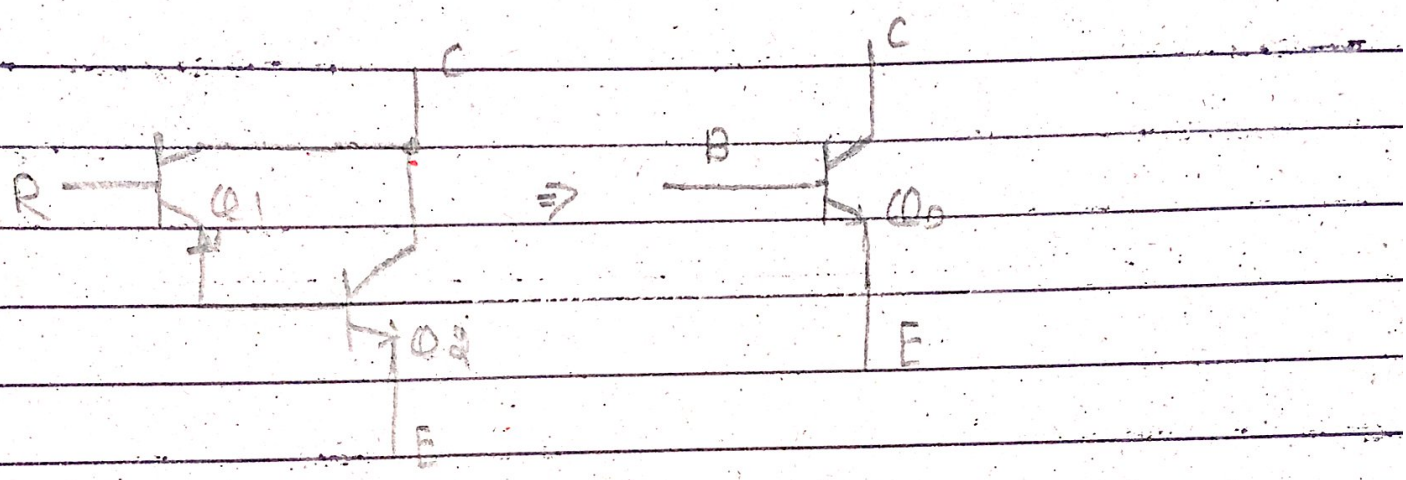
$$\beta_D = \beta_1 \beta_2$$

if $\beta_1 = \beta_2 = \beta$

The darlington Connection provides a current gain of

$D_D = R^2$

DIAGRAM:-



Part (b)

Solution:-

$$\text{Lin Reg} = \frac{0.062}{4.5} \times 100\% = 1.377\%$$

$$\text{Line Reg} = \frac{0.062}{40} \times 100\% = 0.034\%$$

Q2 (a) Compute the magnetic field of a long straight wire that has a circular loop with a radius of 0.05m. 2amp is the reading of the current flowing through this closed loop.

Solution :-

Given

$R = 0.05m$

$I = 2amp$

$\mu_0 = 4\pi \times 10^{-7} N/A^2$

Ampere's law formula is,

$$\oint \vec{B}\, \vec{dl} = \mu_0 I$$

In case of long straight wire.

$$\oint \vec{dI} = 2\pi R = 2 \times 3.14 \times 0.05 = 0.314$$

$$B \oint \vec{dI} = \mu_0 I$$

$$\vec{B} = \frac{\mu_0 I}{2\pi R}$$

$$\boxed{\vec{B} = \frac{4\pi \times 10^{-7} \times 2}{0.314} = 8 \times 10^{-6}\ T}$$

Part B :-

Within the cylinder $\rho = 2, 0 < z < 1$, the potential is given by $V = 100 + 50\rho + 150\rho \sin\phi V$.

(a) Find V, E, D and ρ_v at $P(1, 60°, 0.5)$ in free space.

First, substituting the given point we find $V_p = 279.4V$, then

$$E = -\nabla V = -\frac{\partial V}{\partial \rho}a_\rho - \frac{1}{\rho}\frac{\partial V}{\partial \phi}a_\phi = -\boxed{50 + 150\sin\phi}\,a_\rho - \boxed{150\cos\phi}\,a_\phi$$

Evaluate the above at P to find $E_p = -179.9a_\rho - 75.0a_\phi\ V/m$

M = W.A

Now $D = \epsilon_0 E$, so $D_\rho = -1.59a_\rho - 664a_\phi \text{ nC/m}^2$

$$\rho_v = \nabla \cdot D = \left(\frac{1}{\rho}\right)\frac{d}{d\rho}(\rho D_\rho) + \frac{1}{\rho}\frac{\partial D_\phi}{\partial \phi} = \left[\frac{-1}{\rho}(50 + 150\sin\phi) + \frac{1}{\rho}150\sin\phi\right]\epsilon_0 = \frac{50\epsilon_0 C}{\rho}$$

At P, this is $\rho_v P = -443\rho \text{ C/m}^3$.

(b) :- How much charge lies within the cylinder? Will we integrate ρ_v over the volume to obtain.

$$Q = \int_0^1 \int_0^{2\pi} \int_0^2 -\frac{50\epsilon_0}{\rho}\rho\, d\rho\, d\phi\, dz = -2\pi$$

QUESTION = 03 PART (A)

ANSWER

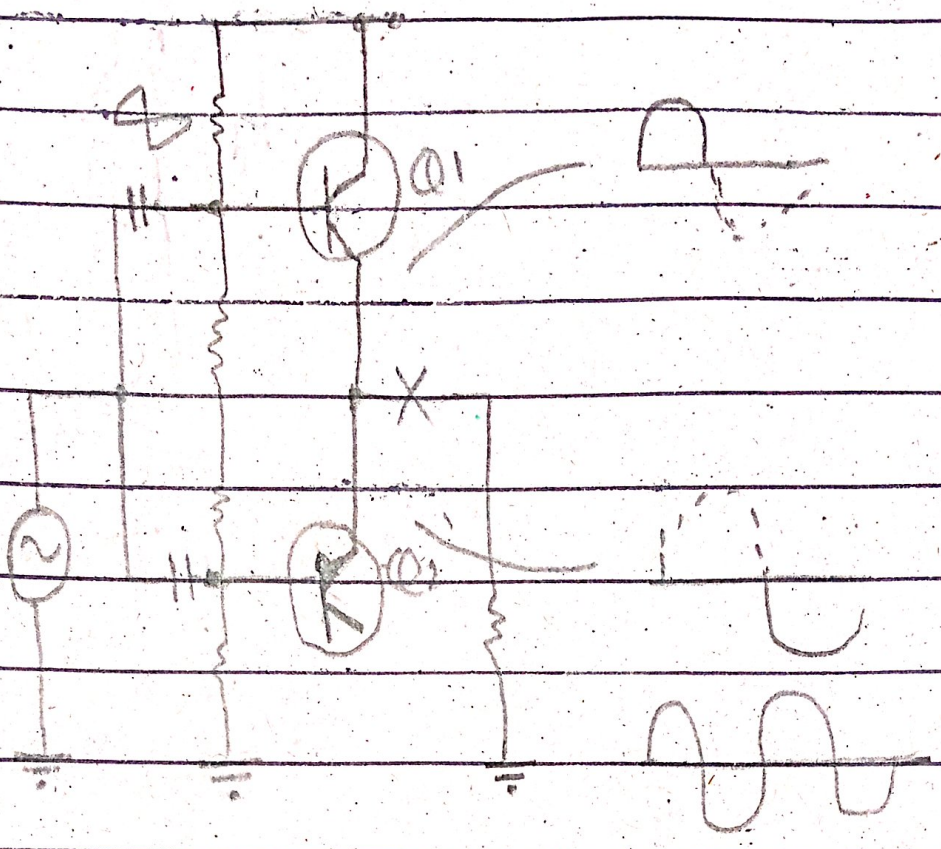
CLASS-B AMPLIFIER

when the amplifier is in its quiescent state both transistors are baised at cutoff.

when the input is positive Q1 is baised above cutoff. transistor consists conducts, producing a replica of the positive input at the output.

Q_2 remains in cutoff

when input is negative, Q_1 baised is baised in cutoff Q_2 is baised above cutoff and the transistor conducts, producing a replica of the negative input at the output.



Typical class B Amplifier

Question No = 04

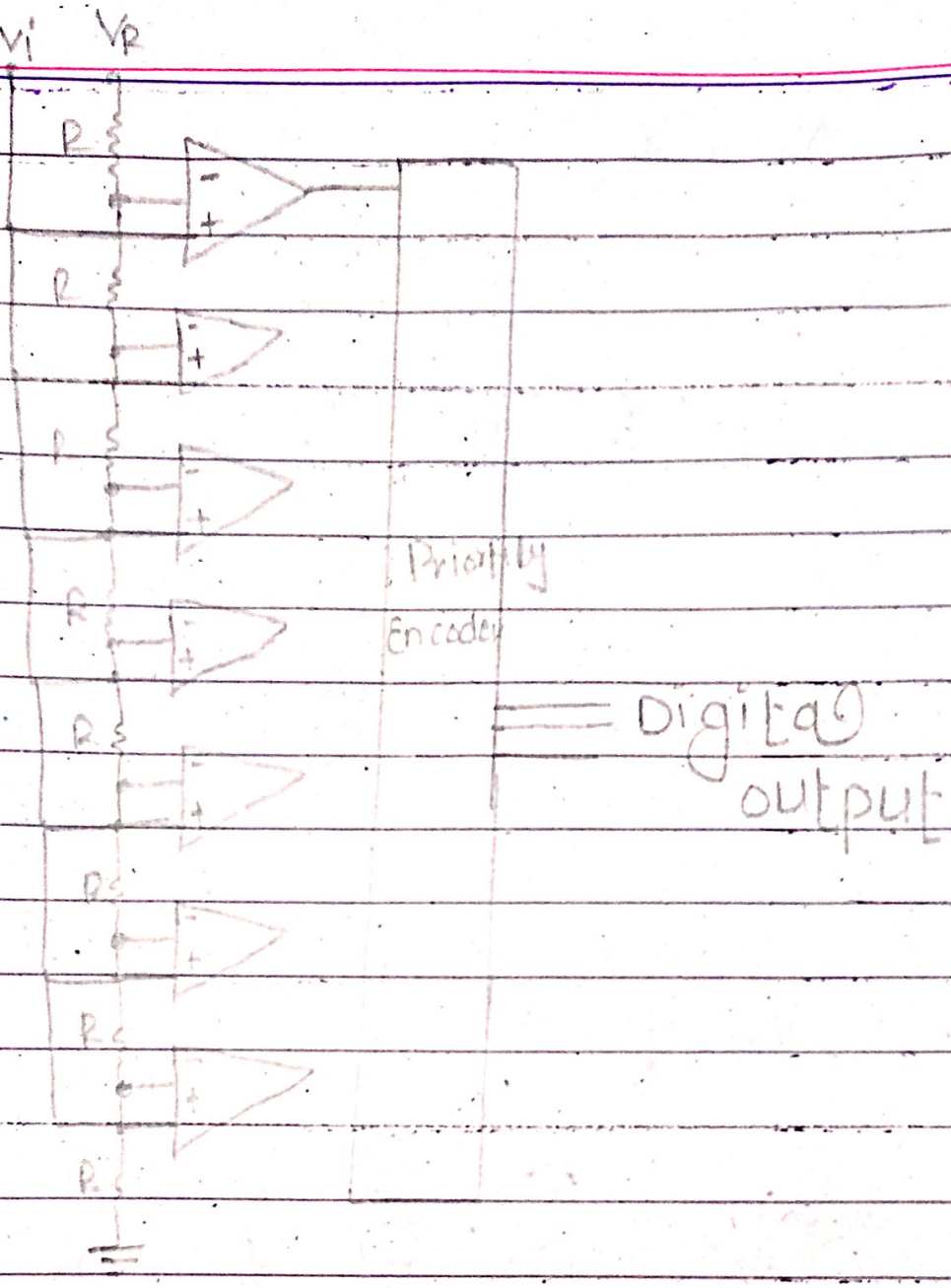
ANSWER :-

FLASH ADC

A flash adc is the type of analog-to-digital converter that uses linear voltage ladder with a comparator at each "rung" of the ladder to compare the input voltage to successive reference voltages.

A flash type adc produces an equivalent digital output for a corresponding analog input in no time. Hence flash type Adc is the fastest ADC.

The circuit diagram of a 3-bit flash type ADC is shown in the following figure -



The 3 bit flash type ADC consists of voltage divider network. 7 Comparators and a priority encoder.

WORKING OF FLASH ADC :-

The voltage divider network contains 8 equal resistors. A

reference voltage V_R is applied across that entire network with respect to the ground. The voltage drop across each resistor from bottom to top with respect to ground will be integer multiples of $\frac{V_R}{8}$

The external input voltage V_i is applied to the non-inverting terminal of all comparators. The voltage drop across each resistor from bottom to top with respect to ground is applied to inverting terminal of Comparators from bottom to top.

At a time, all the Comparators Compare the external input voltage with the voltage drops present at the respective other input terminal. That means the Comparison Operations take place by each comparator parrallely.

The output of the comparator will be 1 as long as Vi is greater than the voltage drop.

All the outputs of the comparators are connected as the inputs of priority encoder.

Therefore the output of priority encoder is nothing but the binary equivalent of the external analog input voltage Vi.

The flash type Adc is used in the applications where the conversion speed of analog input into digital data should be very high.

QUESTION NO = 5 Part (A)

In low pass filter LPF circuit allows the frequency underneath cutt-off frequency for flowing through it while in High pass filter HPF circuit allows the frequencies over cut-off frequency for flowing through it.

In low pass filter it can be built with a resistor which is followed by a capicitor while in high pass filter it can be build with a capicator which is followed by a resistor.

In low pass filter it is important in eliminating the aliasing effect while in high pass filter it is important whenever the distortion occurs because of low frequency single like noise is to be detached.

In low pass filter it is lesser than cut-off frequency while in high pass filter it is higher than cut-off frequency.

QUESTION No = 05 Part (b)

ANSWER :-

Due to presence of active components, the active filters are expensive.
However, the low cost of the passive filters is the result of the presence of the passive component in it.

The circuit osintation of the active filters is quite complex circuit.
Active filters possess high value of quality factor as compared to passive filters.

Active filter need an external supply of power for circuit operation. But passive circuit do not require external energy source because it drives the energy for operation from

the applied voltage signal.

As inductor is the basic component used in passive filters and it generates problems at low frequencies. thus passive filters are suitable for RS Range operation. while active filter provides a better responce at low frequency.

The weight of active filter is low while passive have high.

Active Components show greater sensitivity towards temperature changes. However passive components are comparatively less sensitive towards the same.