(21)

* Explain the input and output characteristic of common emitter un configuration of transistor amplifier with neat diagram.?

Ans: Common Emitter.

↳ The Configuration in which the emitter is connected between the collector and base is known as common emitter configuration.

↳ The input circuit connected between emitter and base and the output circuit taken from collector and emitter.

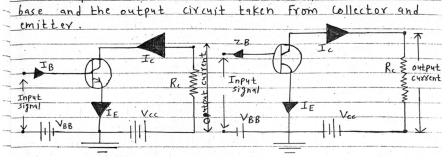


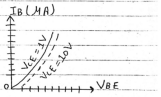
Fig: NPN transistor. Fig: PNP transistor

* Input characteristics:

↳ It is the curve between base current I_B and base Emitter voltage V_{BE} at constant collector emitter voltage V_{BE}.

↳ The characteristics resembles that of a Forward biased diode curve.

↳ Input resistance $r_i = \frac{\Delta V_{BE}}{\Delta I_B}$ at constant V_{CB}.

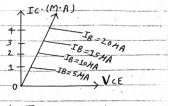


* Output characteristics.

↳ It's the curve between collector current I_C and collector Emitter voltage V_{CE} at constant base current I_B.

↳ output curve has some slope but while CB has most horizontal characteristics.

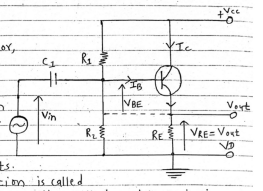
↳ output resistance $R_{out} = \frac{\Delta V_{CE}}{\Delta I_C}$ at Constant I_B.



(22)

* Explain the Principle of operation of common collector (CC) amplifier.?

↳ The Common Collector amplifier is another type of bipolar Juction transistor, (BJT) configuration where the input signal is applied to the base terminal and the output signal taken from the emitter terminal. Thus the Collector terminal is common to both the input and output circuits. This type of the configuration is called common collector (cc) because the collector terminal is effectively "grounded" or "earthed" through the power supply.



* Characteristics of CC.

① As the circuit of the configuration is designed it's input is taken across the base and the output across the emitter.

② The variation in between the applied input and output voltage is directly related to each other.

③ In this type of amplifier the load resistance is able to receive the currents from both the emitter and base terminal.

④ The resultant emitter current is the combination of the base and the collector current this make circuit higher current gain.

⑤ It maintains the gain of the voltage at the level of unity.

⑥ The gain of Power for this transistor is to be at medium.

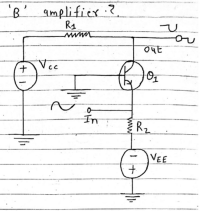
⑦ The resistance at the input is high enough.

⑧ The resistance value at the output is to be low.

(23)

* Explain operation of class 'B' amplifier.?

↳ As was stated above, a class B amplifier operats for 50% of the input signal. A simple class B amplifier shown in the figure below.



↳ In the circuit shown in the figure, above the base-emitter bias will not allow the transistor to conduct whenever the input signal becomes positive.

Fig: A simple class B transistor amplifier.

↳ Therefore, only the negative position of the signal is reproduced in the output signal. You may wonder why a class B amplifier would be used instead of a simple rectifier if only half the input signal is desired in the output.

↳ The answer to this is that the rectifier doesnot amplify. The output signal of a rectifier cannot be higher in amplitude than the input signal.

* Explain class 'C' amplifier operation.?

↳ The figure below shows a simple class C amplifier. Notice that only a small portion of the input signal is present in the output signal since the transistor doesnot conduct except during a small portion of the signal, this is the most efficient amplifier. it is also has the worst fidelity.

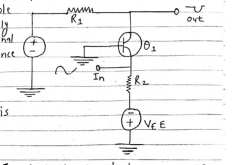


Fig: A simple class 'C' transistor amplifier

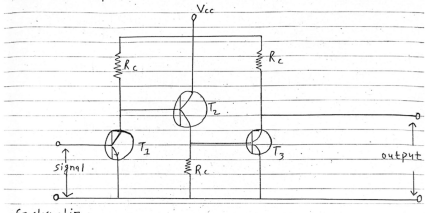
(25)

* Explain operation of direct coupled amplifier.?

Ans: Operation.

↳ The input signal when applied at the base of transistor action and the amplified output appears at the collector resistor R_C of transistor T_1. This output is applied to the base of transistor T_2, which further amplifies the signal.

In this way, a signal is amplified in a direct coupled amplifier circuit.



Construction.

↳ The figure below indicates the three stage direct coupled transistor amplifier. The output of first stage transistor T_1 is connected to the input of second stage transistor T_2.

↳ The transistor in the first stage will be an NPN transistor, while the transistor in the next stage will be a PNP transistor and so on. This is because the variations in one transistor tend to cancel the variations in the other.

↳ The rise in collector current and the variation in B of one transistor gets cancelled by the decrease in other.

(26)

* Principle of microphone.

↳ A microphone converts sound into an electrical signal.

↳ Microphone work on converting a vibration into an electrical energy.

↳ Microphone are used in many application such as for concept halls and Public events, telephone, hearing aids, public address system.

↳ They are also used in Computers for recording voice, speech recognition VOIP.

* Electronics switch.

↳ In electronics an electronic switch is an electronic device or component that can switch an electrical circuit, interrupting the current or diverting it from one to another.

↳ Electronics switches are considered binary devices they can ON or OFF.

↳ Typically electronics switch are used solid state device such as transistors, though Vaccum tubes can be used as well in high voltage application.

* Head Phone and earphone.

Ans: Head-Phone.

↳ Headphones let a single user listen to an audio source privately, in contrast to an loudspeaker, which emits sound into the open air for anyone nearby to hear.

↳ Headphone are also known as earspeakers, earphone or colloquially, cans.

Earphone:

↳ An electrical device worn on the ear to receive audio or telephone communications or to listen to a audio mp3 player etc.

(27)

* Mosfet.

↳ Metal oxide Semiconductor. FET (Mosfet).

The main drawback of JFET is that it's gate must be reverse biased for proper operation of the device.

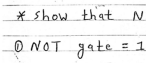
↳ A Field effects transistor (FET) that can be operated in the enhancement mode is called a mosfet.

↳ A mosfet is an important semiconductor device and can be used in any of the circuits covered for JFET.

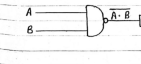
↳ A mosfet has several advantage over JFET including high input impedance and low cost of production.

* show that NAND gate realization of basic gate.

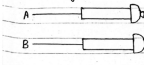
① NOT gate = 1 NAND gate



② AND gate = 2 NAND gate.



③ OR gate = 3 NAND gate.



(28)

* Varactor diode.

↳ A Junction diode which act as a variable capacitor under changing reverse bias is known as Varactor diode.

↳ When a P-N Junction is formed depletion layer is created in the Junction area.

↳ since there are no charge carries within the depletion zone, the zone acts an insulator.

↳ The P-type material with hole as majority carries and n-type material with electron -ve charge as majority carries act as a charge plates.

* LED (Light-Emitting Diode).

↳ A LED is a diode that gives off visible light when forward biased.

↳ light emitting diode are not made From Silicon or Germinium but are made by using element like galium, phosphorous and arsenic.

↳ By Varying the quantities of these element It is possible to produce light of different wave lengths with colours that include red, green, yellow & blue.

* Tunnel diode.

↳ A two-terminal semi-conductor diode using tunneling electron to perform high speed switching operation.

↳ A tunnel diode or esaki diode is a type of semi-conductor diode that has effectively negative resistance" due to the quatum mechanical effect called tunneling.

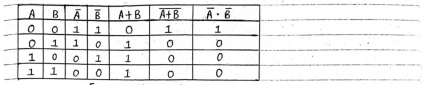
↳ When voltage is increase current flow is decreases. Tunnel diode work based on tunnel effects.

* PN-Junction Diode:→ In a piece of semiconductor (sc), if one half is doped by P-type impurity and the other half is doped by n-type impurity, a PN Junction is formed. The plane dividing the two halves or zone is called PN-Junction.

(29)

* State and Prove De-Morgan's Theorem with necessary diagram and truth table.

→ The Complement of the sum of two or more variables is equal to the product of the complement each of the variables. if A & B are variable then, Mathematically, $\overline{A+B} = \bar{A} \cdot \bar{B}$



A	B	$\bar{A}$	$\bar{B}$	A+B	$\overline{A+B}$	$\bar{A} \cdot \bar{B}$
0	0	1	1	0	1	1
0	1	1	0	1	0	0
1	0	0	1	1	0	0
1	1	0	0	1	0	0

Fig: truth table

second law

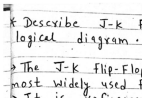
↳ The complement of the product of two or more variables is equal to the sum of the complement each of the variables. i.e. $\overline{A \cdot B} = \bar{A} + \bar{B}$

A	B	$\bar{A}$	$\bar{B}$	A·B	$\overline{A \cdot B}$	$\bar{A} + \bar{B}$
0	0	1	1	0	1	1
0	1	1	0	0	1	1
1	0	0	1	0	1	1
1	1	0	0	1	0	0

fig: truth table.

(25)

* Describe J-k Flip-Flop with necessary truth table, logical diagram.



→ The J-K Flip-Flop is the most widely used Flip-Flop.

→ It is refinement of SR Flip-Flop which avoid indeterminate state.

→ When inputs are applied to both J and K simultaneously the Flip-Flop are switched to it's Complement.

* J-K Flip-Flop circuit diagram.

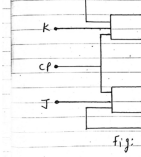


Fig: Logic Diagram of JK Flip-Flop.

Working

↳ When J is high K is low, the output Q goes high on triggering the edge of clock pulse and Flip-Flop is set. When J is low, K is high the output Q goes low on triggering the edge of clock pulse and flip-flop is reset.

J	K	$Q(t)$	$Q(t+1)$
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

Fig: Truth table

Q_{n+1}	$\bar{J}\bar{K}$	$\bar{J}K$	JK	$J\bar{K}$
$\bar{Q}_n$	0	0	1	1
Q_n	1	0	0	1

$Q_{n+1} = J\bar{Q}_n + \bar{K}Q_n$