

Course Details

Course Title: Electronic Circuit Design
Instructor: _____

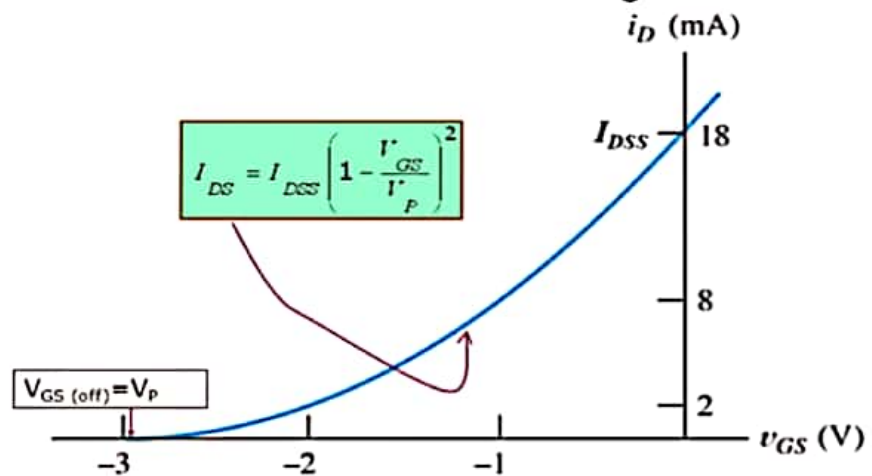
Module: _____
Total Marks: _____

Student Details

Name: _____

Student ID: _____

Q1. Explain the trans conductance curve for n-channel JFET given below



Q2. State the characteristics of a practical operational amplifier.

Q3. Calculate output voltage for summing amplifier if $V_1 = 0.2V$, $V_2 = 0.5V$ and $V_3 = 1V$; $R_1=R_2=R_3=R_f = 6k\Omega$

Q4. (a) You are working on an audio circuit in the lab. Which class of power amplifier will you not consider for your work?

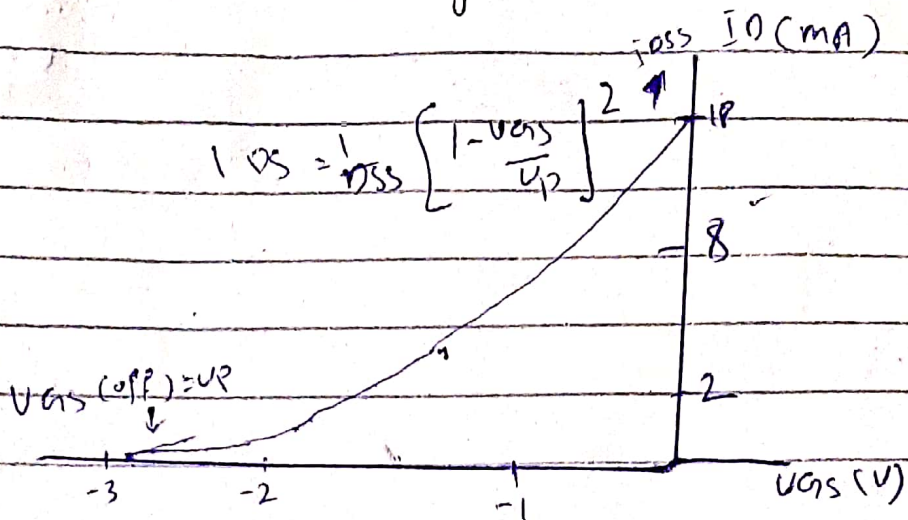
Justify your answer with reason.

(b) Outline the differences between an amplifier and a rectifier.

Name: Naveed Ali

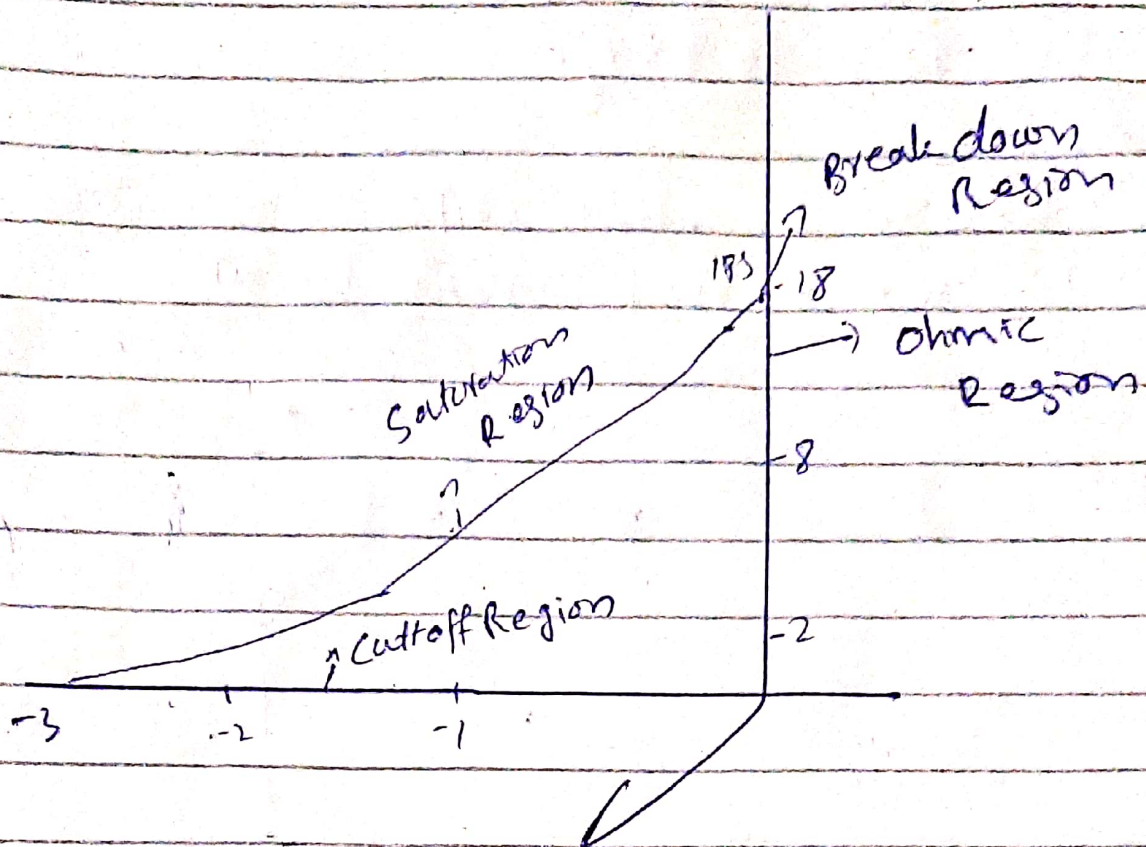
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Q1. Explain the trans conductance curve for N-channel JFET given below.



The transconductance characteristics curve of a JFET transistor is the curve which shows graph of drain current (I_D) versus the gate-source voltage (V_{GS}).

The ratio of change in drain current ΔI_D , to the change in gate source voltage ΔV_{GS} is the transconductance (g_m).



Cutoff Region-

This is the region where the JFET transistor ~~begins to show some resistance to the drain current~~ is off. And no I_D flows from drain source.

Ohmic Region

The region where the JFET transistor begins to show some resistance to drain current I_D .

This is the only region in the ~~characteristic~~ curve where the response is linear.

Saturation Region.

This is the region where the JFET transistor is fully operation and maximum current for the voltage V_{DS} that is supplied is following flowing. During this region the JFET is on and active.

Break down Region.

This region where the voltage V_{DS} that supplied to the drain of the transistor exceeds the necessary maximum. At this point JFET lose ability to resist current.

Q2:

State the characteristics of a practical operational Amplifier.

Ans.

The practical op-amp has following characteristics.

1. The open loop voltage gain A_o is maximum & finite, typical value for practical op-amp is considered to be 200,000.
2. The ~~input~~^{output} impedance Z_o is minimum not zero, in the order of 100 or less.
3. The input impedance Z_i is maximum & finite in order of 100k or more.
4. The CMRR is maximum & finite.
5. Bandwidth is maximum & finite. i.e. it can amplify dc to 1 MHz signal.
6. Slight drift of characteristics due to change in temperature not null.

7. Two terminals may be virtually ground not $v_d = 0$ exactly for all conditions.

8. Maximum slew rate and has the finite value.

9. The output is negligible due to dc-bias when the input is zero.

~~Q.~~

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Q3. Calculate output voltage for summing amplifier if $V_1 = 0.2V$, $V_2 = 0.5V$ and $V_3 = 2V$ and $R_1 = R_2 = R_3 = R_f = 6k\Omega$.

Sol. Given data

$$V_1 = 0.2V$$

$$V_2 = 0.5V$$

$$V_3 = 2V$$

$$R_1 = 6k\Omega$$

$$R_2 = 6k\Omega$$

$$R_3 = 6k\Omega$$

$$R_f = 6k\Omega$$

$$V_{out} = ?$$

we know that

$$V_{out} =$$

$$V_{out} = -R_f \left[\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3} \right]$$

$$V_{out} = -6 \left[\frac{0.2V}{6k\Omega} + \frac{0.5V}{6k\Omega} + \frac{2V}{6k\Omega} \right]$$

~~So All the~~

So, All resistance value are same they will cancel each other.

Now

$$V_{out} = -[0.2V + 0.5V + 2V]$$

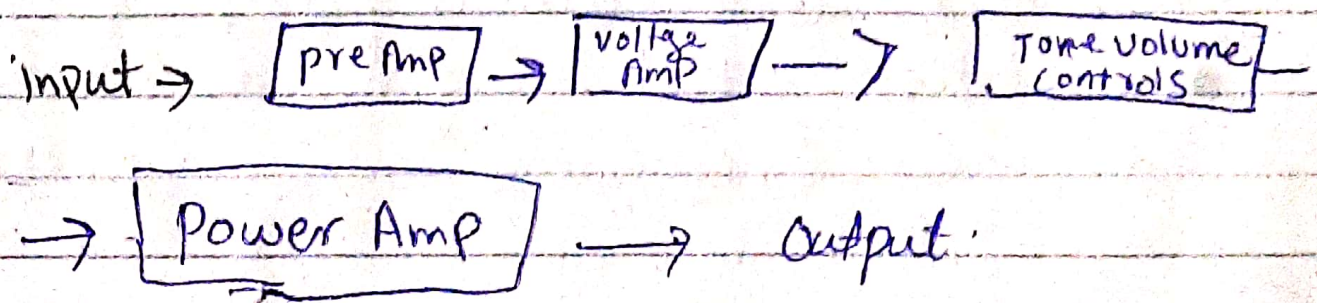
$$\boxed{V_{out} = -2.7V}$$

Q4(a) You are working on a audio circuit in the lab. which class of power amplifier will be not consider for your work. Justify your answer with reason.

Ans: Power Amplifier.

A power amplifier is an electronic amplifier designed to increase the magnitude of power of a given input signal is increased to level high enough to drive loads of output devices like speakers, headphones, RF transmitter's etc.

Block Diagram of Audio Amplifier.

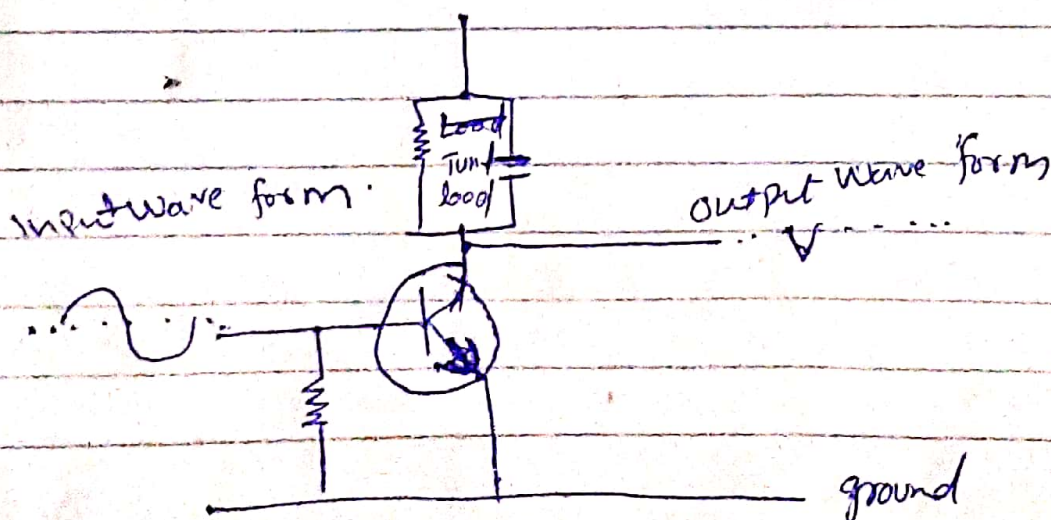


Class C Power Amplifier.

The design of Class C. power amplifiers allows greater efficiencies but reduces the linearity/ conduction angle. which is under 90° . In other words, it sacrifices good quality of amplification for increase in efficiency.

Lesser conduction angle implies greater distortion and so this class of amplifier are not suited for audio amplification.

Class C. amplifier generally contain a tuned load which filters & amplifies input signal at certain of other's frequencies are suppressed.



In this type of power Amplifier, the active element conducts only when the input voltage is above a certain threshold. which reduces power dissipation and increases efficiency.

Reason:

While the form of transistor biasing gives a much improved efficiency of around 80% to the amplifier. It produce a very high distortion of the output signal. Therefore class C. amplifier are not suitable for use as audio amplifiers.

Q4(b)

Outline the difference between an amplifier and a rectifier.

Amplifier:

It is a device which increases the strength / voltage of a signal.
(By strength, it is generally the power of a signal.)

There are many types of Amplifiers like Voltage, power, current etc. (Refer to Sedra and Smith for more).

In practice (there may be exception) Voltages of the order of milli volts or microvolts is amplified (to 1V or near 1V)

In general the work on the principle of ~~cross-conductance~~ / voltage dependent current source / current dependent voltage source etc.

To be simple, voltage / current following through one pair of terminals must affect voltage / current following through other pair.

Rectifier.

It is a ~~device~~ device which converts a AC signal to DC. Although at class 12 level one might be knowing about half wave rectifier and full wave rectifier using transformers, diodes and capacitors. There are other types ~~also~~ ^{also} which uses thyristors. ~~and whole~~

Rectifiers are generally used to convert AC voltage to DC Voltages.