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| Lab 3: Push-Pull Power Amplifier |

Student Name: Click or tap here to enter text.

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Preparation

1. For the power amplifier of Figure 1, determine the value of CS for the cutoff frequency of 50Hz or less (f3dB=1/(2πRLCS)). For simplicity, assume the power stage is a dependent voltage source with zero output impedance. Show your hand calculation.



Final answer: Click or tap here to enter text.

1. Simulate the class-B push-pull power amplifier in Figure 1(a) with a 1kHz 12VPP sinusoid input biased at 6V.
2. Show your schematic.



1. Plot Vi, Vx, Vo, ID1. Use the value calculated in the preparation for CS. Simulate the circuit long enough (about 50~ms) to let $C\_{s}$ settle, and zoom in to the portion close to the end of the simulation to show a few cycles of the sinusoid.



1. Determine the value of VOS and R1 in Figure 1(c) required to cancel the dead zone using the plot in the previous step.
2. Plot showing no dead zone.



1. Final values: Click or tap here to enter text.
2. Simulate the class-AB push-pull amplifier in Figure 1(c) using the value of R1 found in the previous step. Adjust the input signal source such that the output node, VX is biased at 6V with a 2VPP swing.
3. Show your schematic.



1. Plot Vi, VX, VO, ID1. Simulate the circuit long enough (about 50ms) to let CS settle and zoom in to the portion close to the end of the simulation to show a few cycles of the sinusoid. Make sure that the power transistors are biased just in class-AB region, so the power consumption is kept minimum while the dead zone is cancelled. This step requires fine tuning of R1 as well as the input signal source.



1. Determine the voltage gain of the power amplifier. This can be done simply by comparing the input to output sinusoid amplitude.

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Lab - Part II: Class-AB Power Amplifier Implementation

1. Set the current limit to 250 mA.
2. Assemble the **Class-AB amplifier** on the breadboard, ensuring all connections are secure and components are correctly placed.
3. Adjust R1 to set the amplifier just into Class-AB mode. Gradually increase R1 (and thus Vos) from its minimum. Apply an input signal and monitor the output on the oscilloscope. Stop adjusting when the dead zone in the output waveform disappears.
4. Plot output waveform when R1 is at its minimum (showing a dead zone in the output waveform):



1. Plot output waveform when R1 is adjusted to eliminate the dead zone:



1. Set the signal generator to produce a 1 kHz sinusoidal signal with an amplitude of 2 Vpp, biased at 6 V at the output. Show the input and output waveform.



1. Measure the **input and output peak-to-peak voltages** to determine the **voltage gain** of the power amplifier.

Final answer: Click or tap here to enter text.