Elec Eng 2EI5
Design Project #3

Problem Statement

Design, simulate, and build an amplifier that can take an input of ±0.5V from a source with an internal resistance of 100Ω and deliver it to a 100Ω load with good linearity and less than 10% attenuation.

Requirements

1. Physical circuit.
2. Simulations.
3. You are limited to the dc supplies available from your Digilent module.
4. You are limited to a single transistor (MOSFET or BJT).
5. You may not use op-amps for this project.
6. In testing your circuit you should feed the input into the circuit from your Digilent function generator through a 100Ω resistor that you connect in series with the function generator. You should demonstrate different waveforms from the function generator. You should demonstrate different amplitudes up to 0.5V.

Report Requirements

Submit a video report as detailed below. Items with a number in parentheses indicate marks given for that item. Items without numbers are absolutely required. A video missing one or more of these items will receive 0 for the entire project.

1. Appear on the video stating your name and the date of the recording.
2. (3 minutes) Share your screen to show your circuit schematic. Explain:
    a. (5) What type of transistor did you choose (MOSFET/BJT)? Why?
    b. (5) What amplifier topology (CE/CS/CD/etc.) did you choose? Why?
    c. (5) What calculations did you use to determine the required component values?
3. (5 minutes) Share your screen to show your simulations. Explain:
    a. (5) How did you model the transistor in the simulator you used?
    b. (5) What settings did you use for each simulation (transient/dc sweep/frequency sweep/etc.)?
    c. (5) The overall gain determined from the simulations.
    d. (5) Other performance parameters determined from the simulations.
4. (2 minutes) Show your physical circuit on camera. Point to the wires from input to output to show how the circuit is connected in a way corresponding to your schematic.
5. (5 minutes) Share your screen to show your waveforms measurements. Explain:
    a. (5) What measurements did you do? (E.g. waveforms as functions of time, XY plot, network analyzer, etc. You decide which measurements are beneficial and explain why you used them.)
    b. (5) How did you determine the midband gain for your amplifier? What value did you obtain? Compare your value with what was expected from calculations and simulations.
    c. (5) Demonstrate linearity at an input amplitude of 0.5V.