Analog Electronics 2021

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Mini-project 2

1. Find DC gain and UGB of the opamp LT1013 using LTspice. Use this information to determine the component values of following LT1013 linear macro-model:

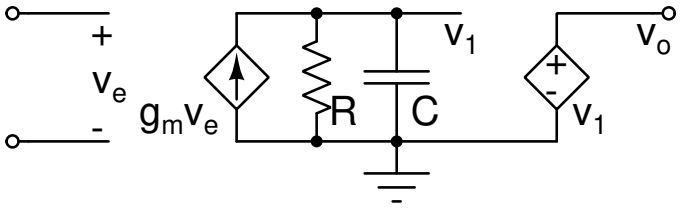

Figure 1: Opamp macro-model

   Include the following in report:

   - Screenshot of test-bench to find gain and UGB.
   - Macro-model with its component values.
   - Frequency response of LT1013 and its macro-model in the same plot with clear annotations of important points. (Use AC analysis)
   - Comments.

2. Design an instrumentation amplifier using LT1013 including biasing and coupling to realize this operation:

$$V_o = 4(V_1 - V_2)$$

   Specifications:

   - V_1 and V_2 frequency range: 1 kHz-10 kHz
   - Less than 0.1 dB gain variation in signal frequency
   - Load: 10 kΩ. Signal source: Ideal voltage source. Both load and source are single-ended.
   - Supply: Single 30 V source
   - Total bias current excluding opamp: <1 mA
   - Use resistor values between 1 kΩ - 100 kΩ

   Objective is to meet the specs while using minimum value for capacitors and maximizing CMRR.

   Include the following in report:

   - Screenshot of LTspice schematic with component values.
   - Frequency response plots w.r.t. one input at a time overlaid in the same window. (AC analysis)
   - Output magnitude plot when both the inputs have AC magnitude equal to 1. (AC analysis)
   - Comments.