Assignment 10

Due: 2023-04-06, 23:59 IST

Problem 10.2

The shaded region in the enclosing box is a common-emitter amplifier circuit.

(a) Prove that the output impedance of the amplifier is given by

\[ Z_o = \frac{1}{g_m R_2} \]

(b) Assume that the output impedance of the amplifier is 1000 Ω and the load resistor is 500 Ω. Choose values of \( R_1 \) and \( R_2 \) such that the voltage gain of the amplifier is 20 dB.

Figure 1: A typical circuit configuration.

**Figure 1:** A typical circuit configuration.

1. Determine the differential mode output resistance of the op-amp of figure 1(a).
2. Determine the low frequency differential mode gain of the op-amp of figure 1(a).
3. Determine the low frequency common mode gain of the op-amp of figure 1(a).
4. Determine the saturation mode gain of the op-amp of figure 1(a).
5. Determine the common mode gain of the op-amp of figure 1(a).
6. Determine the input referred noise voltage of the op-amp of figure 1(a).
7. Assume that the full-scale output voltage of the op-amp is 10 V peak-to-peak. What is the dynamic range of the op-amp?
8. Determine the voltage gain of the amplifier of figure 1(b) considering the open-loop gain of the op-amp.
9. Determine the output voltage of the amplifier of figure 1(b) considering the load resistor of the op-amp.

**Figure 2:** A typical circuit configuration.

10. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

11. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

**Figure 3:** A typical circuit configuration.

12. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

13. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

**Figure 4:** A typical circuit configuration.

14. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

15. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

**Figure 5:** A typical circuit configuration.

16. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

17. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

**Figure 6:** A typical circuit configuration.

18. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

19. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.

**Figure 7:** A typical circuit configuration.

20. Determine the power gain of the amplifier of figure 1(b) considering the load resistor of the op-amp.