Assume $\mu_n C_{ox}$=120 μA/V², $\mu_p C_{ox}$=50 μA/V², V_{tn}= -V_{tp}=0.7 V, λ_n=λ_p=0.02 V⁻¹, and a supply voltage of 5 V for the following CMOS operational amplifier (OPA).

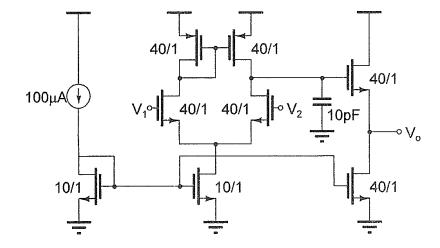1. (20%) Identify the non-inverting input node (V_1 or V_2)
2. (10%) What is the input resistance of the OPA?
3. (10%) What is the output resistance of the OPA?
4. (10%) What is the small-signal voltage gain of the OPA?
5. (10%) What is the maximum input common mode range (ICMR) of the OPA (neglect channel length modulation effect)?
6. (10%) What is the minimum input common mode range (ICMR) of the OPA (neglect channel length modulation effect)?
7. (10%) What is the 3-dB bandwidth of the amplifier?
8. (10%) What is the unity gain bandwidth of the amplifier?
9. (10%) If a load capacitance (C_L) is connected to the node V_o, what capacitance would result in a phase margin of 45 degrees? (neglect internal capacitances of transistors)

試題隨卷繳回