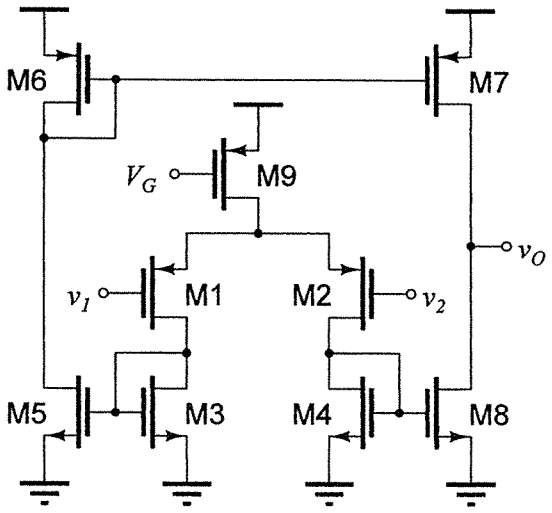
國立臺灣大學 105 學年度碩士班招生考試試題

Please show your work leading to your answers. Please also make proper assumptions for your work.

Assume $\mu_n C_{ox}$=120 μA/V^2, $\mu_p C_{ox}$=50 μA/V^2, V_{tn}= -V_{tp}=0.7 V, λ_n=λ_p=0.05 V^{-1}, and a supply voltage of 5 V. The transistor sizes (W/L) are all 10 μm/1 μm, and the quiescent current is 40 uA for the following CMOS operational amplifier (OPA).



(a) (10%) What is the non-inverting input of the OPA? (v_1 or v_2)
(b) (10%) What is the bias voltage V_G? (Please neglect channel length modulation effect.)
(c) (10%) What is the input resistance of the OPA?
(d) (10%) What is the output resistance of the OPA?
(e) (10%) What is the small-signal gain of the OPA ($v_o/|v_1-v_2|$)?
(f) (10%) What is the slew rate if the OPA has a load capacitance of 10 pF at v_O?
(g) (10%) What is the maximum input common-mode voltage (V_{CMmax}) of the OPA?
(h) (10%) What is the minimum input common-mode voltage (V_{CMmin}) of the OPA?
(i) (10%) What is the unity gain bandwidth of the OPA if the load capacitance is 10 pF at v_O?
(j) (10%) What is the total power dissipation of the OPA when the output voltage (v_O) is 2.5 V and the load is a 10 pF capacitance.

試題隨卷繳回