

國立臺北大學 103 學年度碩士班一般入學考試試題

系(所)組別：電機工程學系甲組(晶片設計組)

科目：電子學 B

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可 不可使用計算機

總分 100 分，每題 10 分

1. The open loop amplifier gain A_0 is not infinite, derive the transfer function $V_{out}(s)/V_{in}(s)$ of the circuit shown in Fig. 1 first and then find the unit gain bandwidth ω_u (the bandwidth when $V_{out}(\omega_u)/V_{in}(\omega_u)=1$).
2. The circuit in Fig. 2 has an open loop gain $A_0=100$, find V_{out} when $V_{in}=1V$?
3. Considering the early effect of the BJT, draw the low-frequency small-signal model and derive the dc gain of the circuit shown in Fig. 3?
4. Ignoring the body effect but considering the short channel effect of the MOSFET, draw the low-frequency small-signal model and derive the output impedance of the circuit shown in Fig. 4?
5. Refer to Fig. 5, the input current is I_{REF} that goes into $N1$. Applying the devices dimensions $N1=(W/L)$, $N2=2(W/L)$, $N3=4(W/L)$, $N4=8(W/L)$, $N5=16(W/L)$, $P1=(W/L)$, $P2=2(W/L)$, where W and L are channel width and length, respectively. What are the currents for $N3$ and $N5$, respectively?
6. The circuit in Fig. 6(a) has a simplified high-frequency small-signal model shown in Fig. 6(b) where the short channel effect, C_{GS} and C_{GD} are neglected. Derive its -3dB frequency (the frequency that has a gain lower than dc gain by 3dB)?
7. Fig. 7 is the Bode plot gain response and phase response of a loop gain for a close-loop transfer function. Explain whether it is a table system or not?
8. For the circuit shown in Fig. 8, explain the reasons to have capacitors C_i and C_b , respectively?
9. For the circuit shown in Fig. 9, explain the reasons to have resistors R_G and R_S , respectively?
10. For the circuit shown in Fig. 10, explain whether a suitable design for current I_1 should be much bigger or smaller than current I_B ?

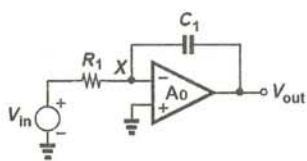


Fig. 1

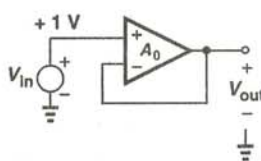


Fig. 2

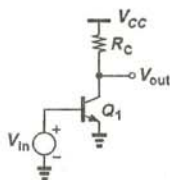


Fig. 3

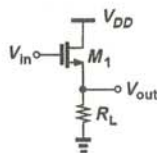


Fig. 4

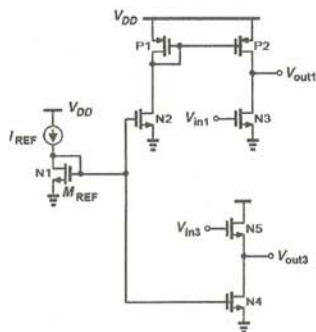


Fig. 5

試題隨卷繳交

接背面

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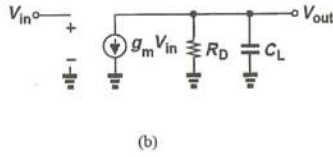
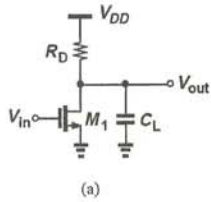


Fig. 6

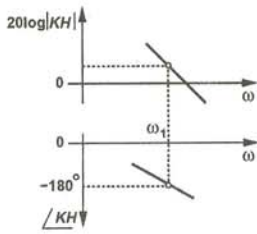


Fig. 7

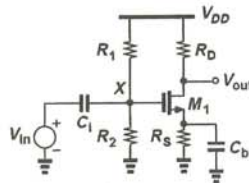


Fig. 8

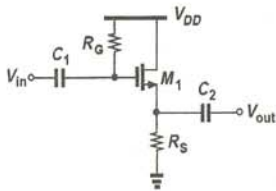


Fig. 9

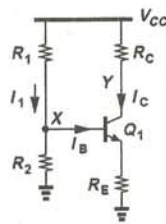


Fig. 10

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