

國立臺北大學 104 學年度學士班暨進修學士班轉學生招生考試試題

系 別：通訊工程學系、電機工程學系學士班 3 年級 考試時間：80 分鐘
 科 目：電子電路 第 1 頁 共 1 頁

可 不可 使用計算機

- (10%) Derive the current I_1 for the circuit in Fig. 1?
- (10%) Derive the voltage V_2 for the circuit in Fig. 2?
- (10%) The feedback system in Fig. 3 has an open-loop amplifier $A_1(s) = A_0 / (1 + s/\omega_0)$, where $s = j\omega$ and ω is the frequency, A_0 and ω_0 are the dc gain and pole frequency of the open-loop amplifier A_1 , respectively. Derive the close-loop transfer function of $Y(s)/X(s)$?
- (10%) Derive the transfer function V_{out}/V_{in} for the circuit in Fig. 4 with $A_0 = \infty$.
- (10%) Draw V_{out} versus V_{in} transfer curve for the circuit in Fig. 5, assuming D_1 is an ideal diode with $V_{ON} = 0V$?
- (10%) Considering the channel length modulation, draw the low-frequency small-signal model and derive the low-frequency gain of the circuit in Fig. 6?
- (10%) For the circuit in Fig. 7, V_{in} and V_{out} are input and output voltages, respectively, V_{b1} is a dc bias voltage. (a) Is M_1 a current source, common-source, common-drain, or common-gate amplifier? (b) Is M_2 a current source, common-source, common-drain, or common-gate amplifier? (You must explain.)
- (10%) Determine the change of V_{out} in Fig. 8 if the input is changed by ΔV_{in} ?
- (10%) Explain the operational principle of an n-channel MOSFET from the effect that is induced by electrical field. (a) How does V_{GS} control I_{DS} ? (b) How does V_{DS} control I_{DS} ?
- (10%) (a) For an npn bipolar transistor, which terminal (emitter, base or collector) requires a high doping concentration, explain why? (b) Should the base-collector junction V_{BC} be forward biased or reverse biased, explain why?

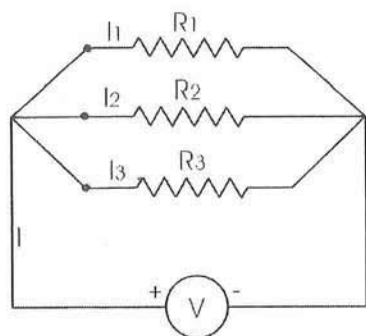


Fig. 1

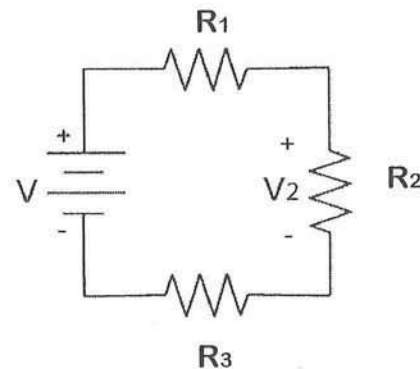


Fig. 2

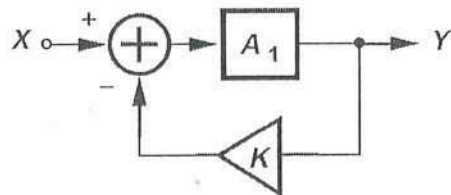


Fig. 3

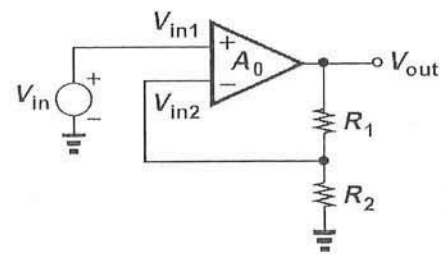


Fig. 4

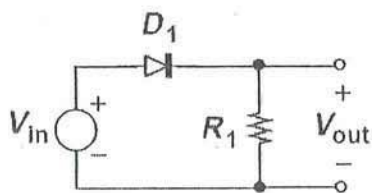


Fig. 5

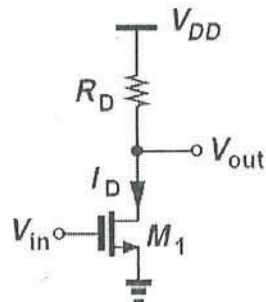


Fig. 6

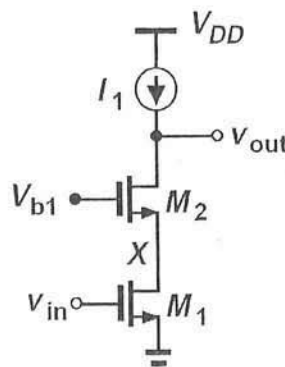


Fig. 7

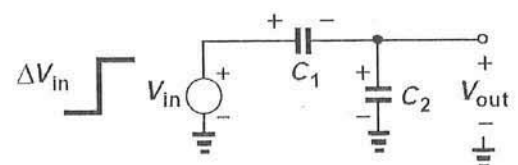


Fig. 8