

國立成功大學 工程科學系 試題

2016/06/20

電子學 (共 5 題，總分 100 分)

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1. For the circuits in Fig.1, find values for the labeled node voltages and branch currents. Assume β to be very high. (15%)

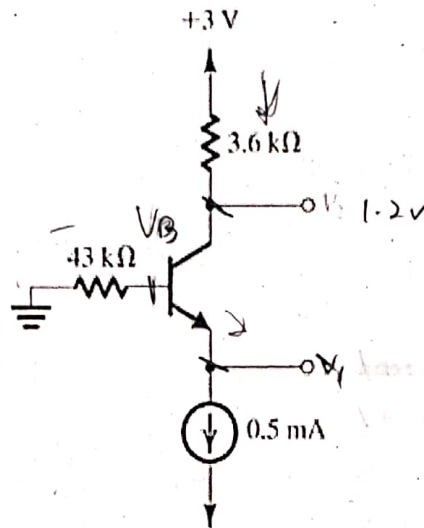


Fig.1

2. In the circuit shown in Fig.2, the transistor has $\beta = 40$.
 (a) Find the values of V_B , V_E , and V_C . If R_B is raised to $100k\Omega$, what voltages result? (10%)
 (b) With $R_B = 100k\Omega$, what values of β if the voltage is fixed at the value that you obtain from (a)? (10%)

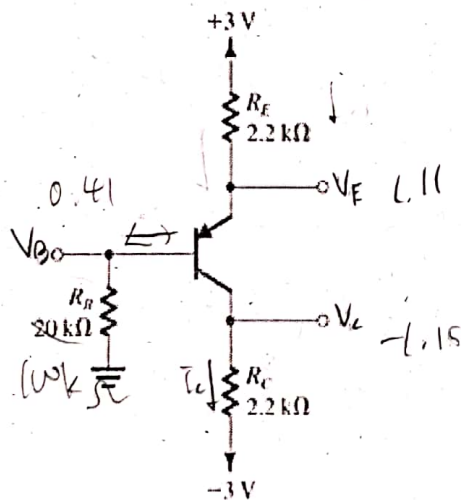


Fig.2

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3. The NMOS transistor in the CS amplifier shown in Fig.3 has $V_t = 1V$, $k'_n(W/L) = 0.5mA/V^2$ and $V_A = 50V$.
 (a) Find I_D and dc voltage at the drain. (10%)
 (b) Find R_{in} and $A_v \equiv v_o/v_{sig}$. (10%)

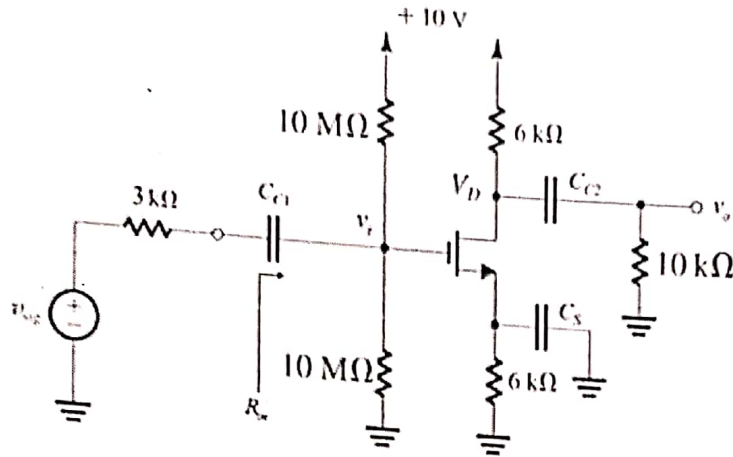


Fig.3

4. The MOSFET parameters in the circuit are $k'_n(W/L) = 1mA/V^2$, $V_t = 1V$.
 (a) Calculate the value V_{DS} and g_m of the MOSFET. (4%)
 (b) Sketch the small signal equivalent circuit. (4%)
 (c) Find the voltage gain v_o/v_i and input resistance R_i . (6%)
 (d) What's the largest allowable signal swing (amplitude) of v_i ? (8%)

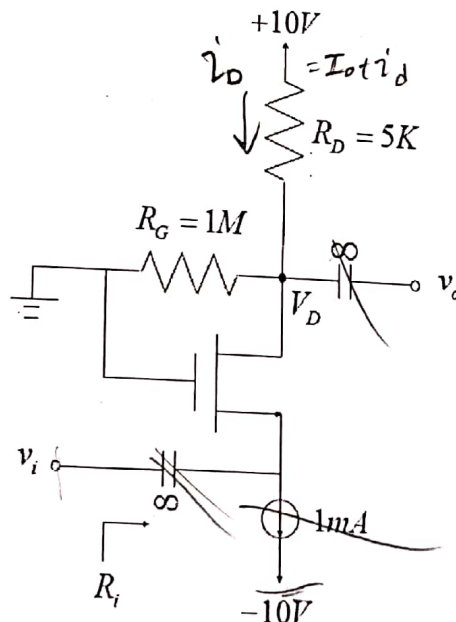


Fig.4

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- circuit to determine the voltage gain $A_v \equiv \frac{v_o}{v_i}$, and R_{in} (13%)

