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考試科目： 電子學

考試日期：0307，節次：1

※ 考生請注意：本試題 可 不可 使用計算機

1. Determine the current I_{D2} and the voltage V_O in the diode circuit shown in Fig. 1. Assume the turn-on voltage of $V_\gamma=0.7V$ for each diode. (10%)

2. A Schottky TTL logic circuit is shown in Fig. 2. Assume the turn-on voltages of $V_\gamma=0.7V$ and $V_\gamma(SD)=0.3V$ are used for all diodes and Schottky diodes, respectively. Also, the turn-on voltage of B-E junction $V_{BE(on)}=0.7V$ and common-emitter current gain of $\beta=30$ are employed for all transistors. (a) Calculate the maximum fan-out for $V_X=V_Y=3.6V$. (b) Using the results of part (a), determine the power dissipated in this circuit for $V_X=V_Y=3.6V$. (22%)

3. Assume the input signal to the circuit in Fig. 3 is $v_i = 75 \sin(120\pi t)$ V and the diode has a cut-in voltage (V_γ) of 0.7 V.

(a) Calculate the average value of the output voltage v_o . (5%)

(b) If a capacitor (50 μF) is added in parallel with the load resistor R_L and the ripple voltage is to be ≤ 4 V, determine the minimum value of R_L for the case of $V_\gamma = 0$ V and $V_\gamma = 0.7$ V, respectively. (10%)

4. Assume the circuit in Fig. 4 is a symmetrical circuit. Derive the ac component of the output voltage v_o for the case of $v_{C1} = v_{C2}$ and $v_{C1} < v_{C2}$, respectively. (10%)

5. Plot transfer curve of the circuit in Fig. 5.

(a) Assume an ideal operational amplifier (op-amp). (4%)

(b) Assume the op-amp has a finite voltage gain (i.e., $A_v \neq \infty$). (5%)

6. A feedback amplifier is shown in the Fig. 6, neglect r_o and body effect of the MOSFET devices. The parameters of M_1 and M_2 : $g_{m1} = g_{m2} = 5$ mA/V.

(a) Which topology is for this feedback amplifier? (4%)

(b) Calculate the feedback factor β . (5%)

(c) Find the voltage gain v_o/v_s , the input resistance R_m , and the output resistance R_{out} . (9%)

7. Consider the class AB Amplifier as shown in Fig. 7.

The circuit is biased with $V_{CC} = 12$ V, and $I_{BIAS} = 20$ mA, the load resistance $R_L = 8$ Ω .

The device parameters are: $I_{SD} = 3 \times 10^{-14}$ A for diodes, and $I_{SQ} = 10^{-13}$ A for Q_N and Q_P , $\beta_n = \beta_p = 75$.

The minimum value for diode current is to be no less than 5 mA

(a) Find the quiescent collector current I_{CQ} for Q_N and Q_P . (8%)

(b) Calculate the maximum average power delivered to the load. (8%)

(背面仍有題目,請繼續作答)

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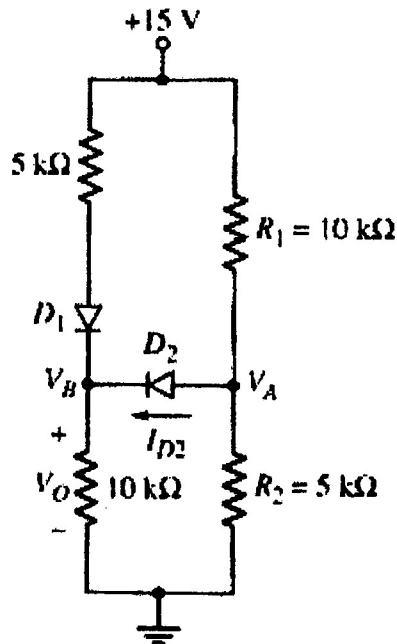


Fig. 1

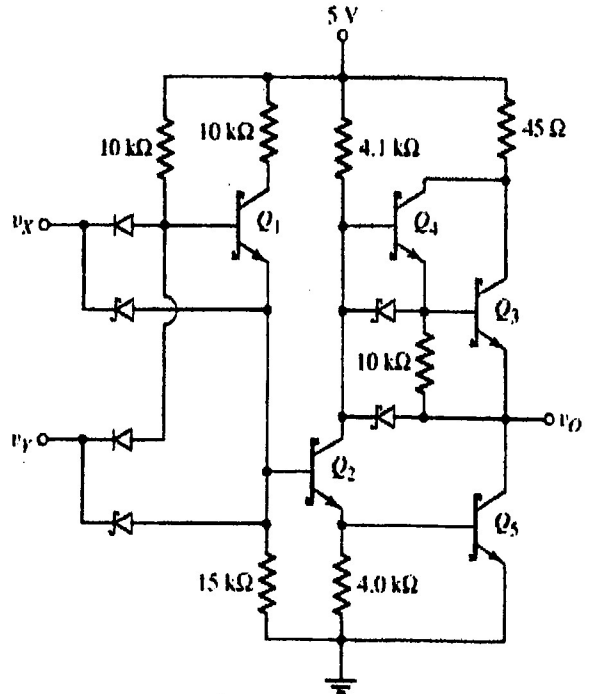


Fig. 2

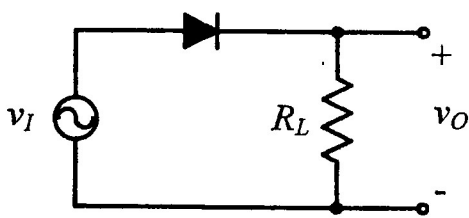


Fig. 3

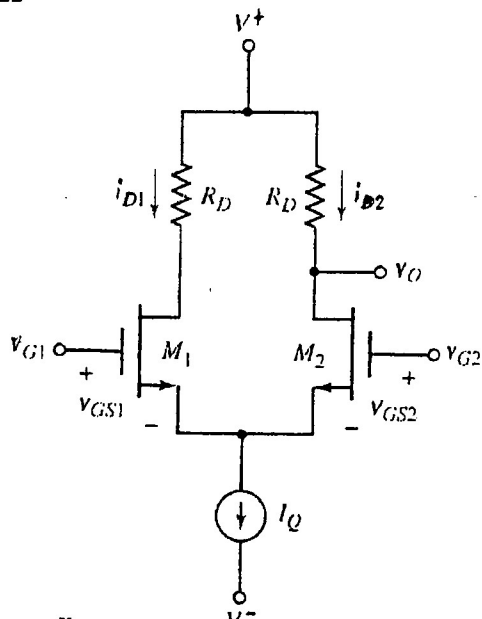


Fig. 4

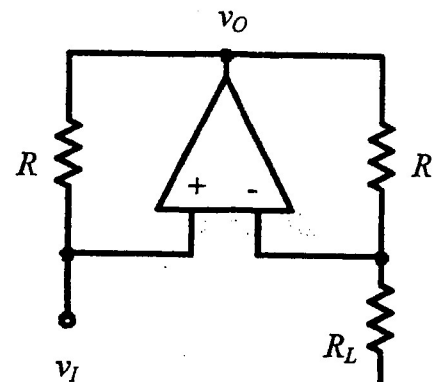


Fig. 5

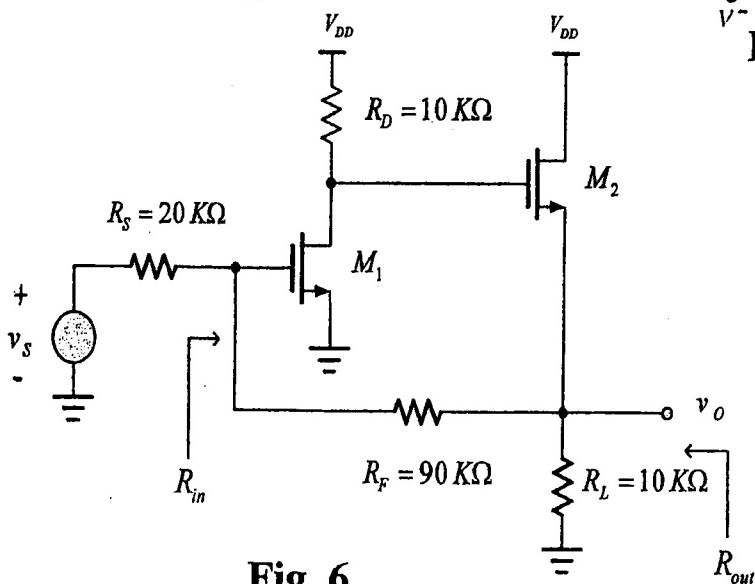


Fig. 6

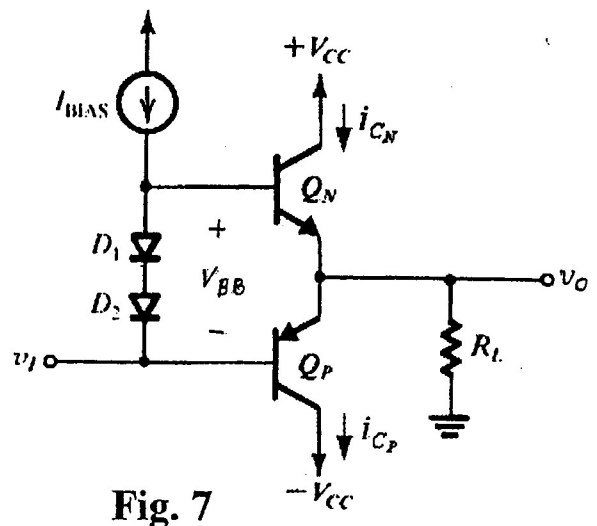


Fig. 7