

國立臺北科技大學

九十五學年度電腦與通訊研究所碩士在職專班入學考試

丁組：電子學 試題

填准考證號碼

第一頁 共二頁

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注意事項：

1. 本試題共【六】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。

(1). (20%) For the circuit shown in Fig. 1, please derive an expression for transfer function V_o/V_i . Find expressions for the magnitude and phase of the response.

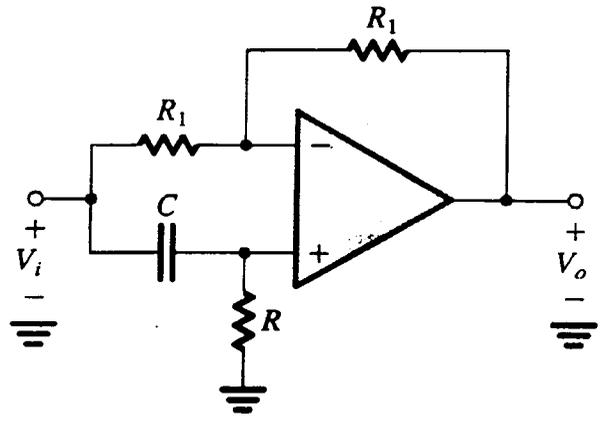


Fig. 1

(2). (10%) Assuming the diode to be ideal, describe the transfer characteristic of the circuit shown in Fig. 2.

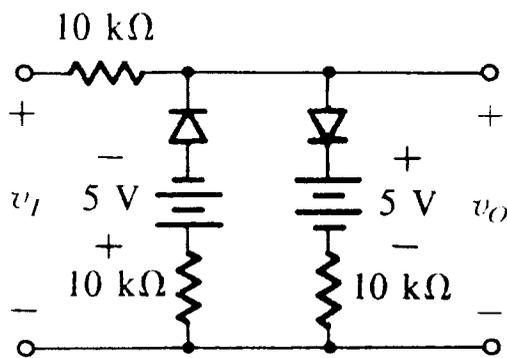


Fig. 2

(3). (20%) The equivalent circuit, as shown in Fig. 3, is the high-frequency hybrid- π model of a bipolar transistor. Please derive the unity-gain frequency of current gain $h_{fe}(s) = I_c/I_b$.

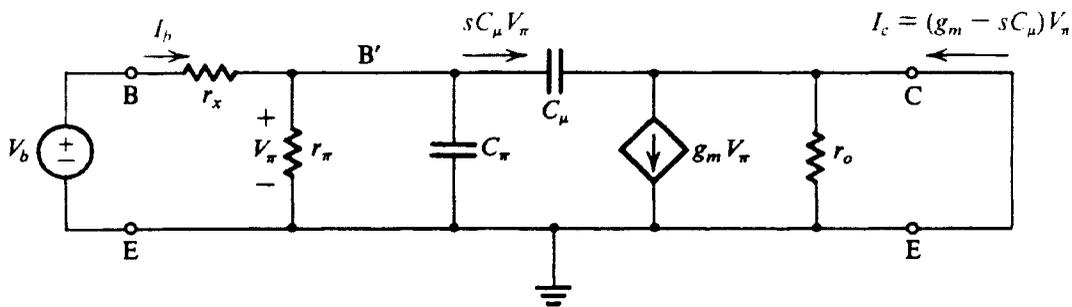


Fig. 3

(4). (20%) The NMOS transistors in circuit of Fig. 4 have threshold voltage $V_t = 2V$, $\mu_n C_{ox} = 20 \mu A/V^2$, $\lambda = 0$, and channel length $L_1 = L_2 = L_3 = 10 \mu m$. Find the required values of gate width for each of Q_1 , Q_2 , and Q_3 to obtain the voltage and current values indicated.

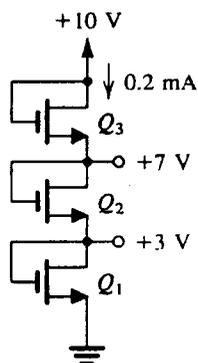


Fig. 4

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(5). (20%) The equivalent circuit of Colpitts oscillator is shown in Fig. 5, please find the frequency of oscillation.

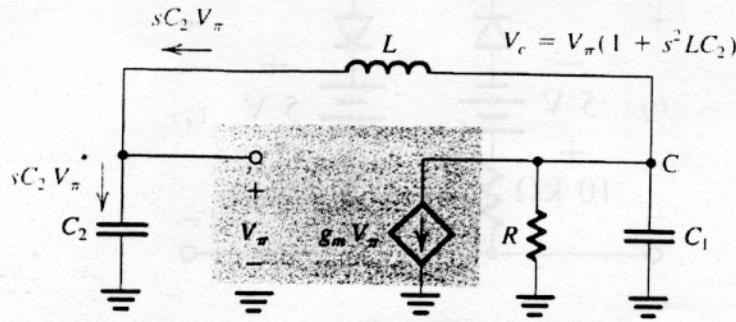


Fig. 5

(6). (10%) Given inputs A, B, C, and D, please design a CMOS logic circuit to implement the logic function $Y=A+B(C+D)$ with minimum number of transistors.

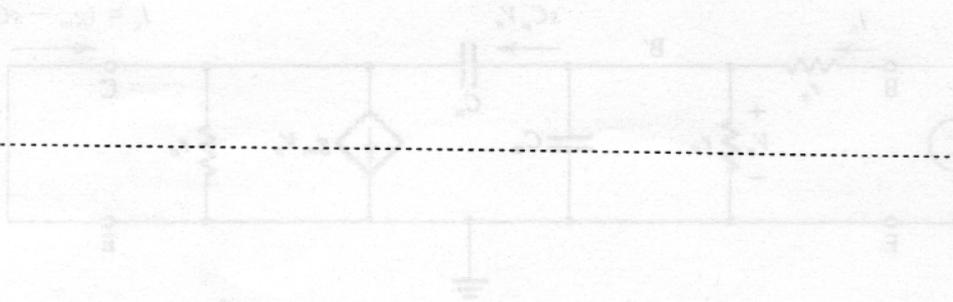


Fig. 3

(4). (20%) The NMOS transistors in circuit of Fig. 4 have threshold voltage $V_{th} = 2V$, $\mu_n C_{ox} = 20 \mu A/V^2$, $\lambda = 0$, and channel length $L_1 = L_2 = L_3 = 10 \mu m$. Find the required values of gate width for each of Q_1 , Q_2 , and Q_3 to obtain the voltage and current values indicated.

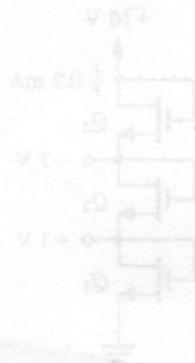


Fig. 4

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