

國立臺北科技大學

九十三年學年度自動化科技研究所入學考試

電子學試題

填准考證號碼

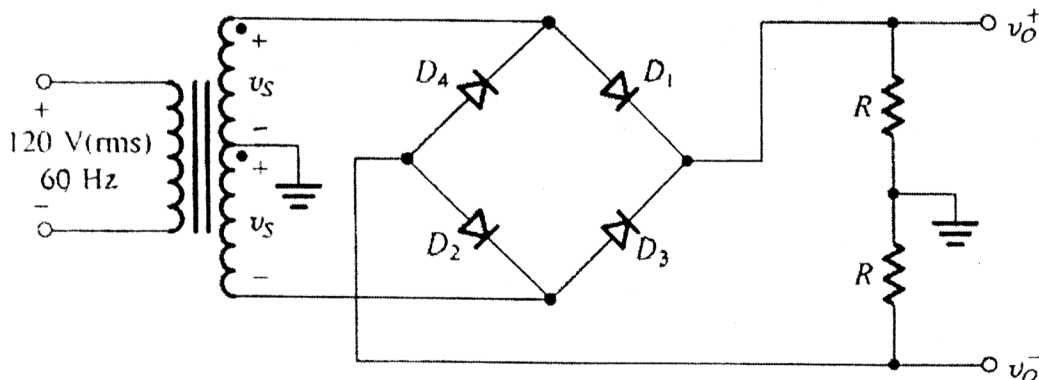
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注意事項：

1. 本試題共八題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，並列出計算或推導過程，否則不予計分。

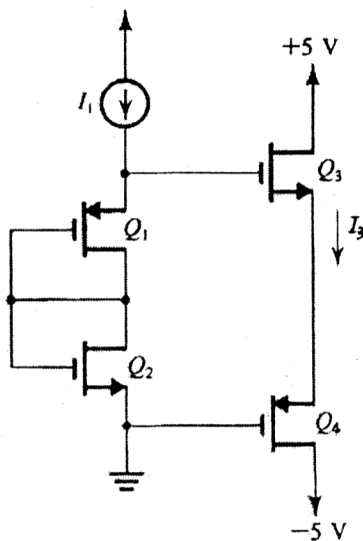
1. For the circuit shown below, assume a 0.7 V drop across each conducting diode. (20%)
 - (a) Sketch and clearly label the waveforms of v_o^+ and v_o^- .
 - (b) If the magnitude of the average of each output is to be 15 V, find the required amplitude of the sine wave across the entire secondary winding.
 - (c) What is the PIV of each diode?



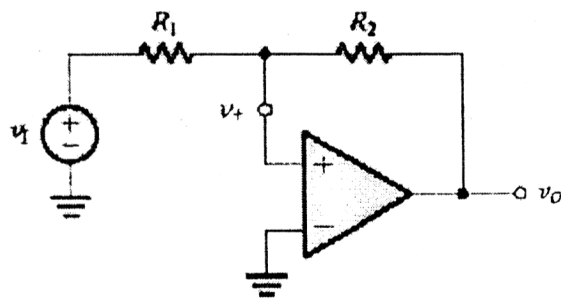
5. For the circuit shown below, (10%)
 (a) Find the relationship between I_3 and I_1 in terms of k_1 , k_2 , k_3 , and k_4 of the four transistors, assuming the threshold voltages of all devices to be equal in magnitude.

$$\left(k = \frac{1}{2} \mu C_{ox} W / L\right)$$

- (b) In the event that $k_1 = k_2$ and $k_3 = k_4 = 16 k_1$, find the required value of I_1 to yield a bias current in Q_3 and Q_4 of 1.6 mA.

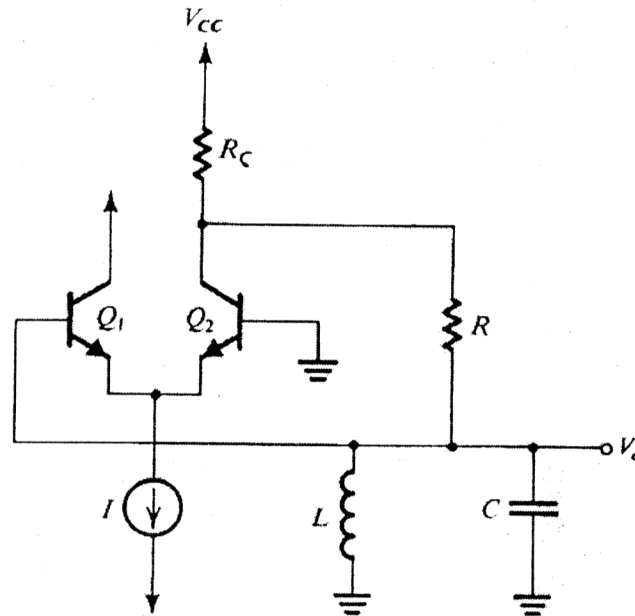


6. Derive and plot the transfer characteristic of the following circuit. (10%)

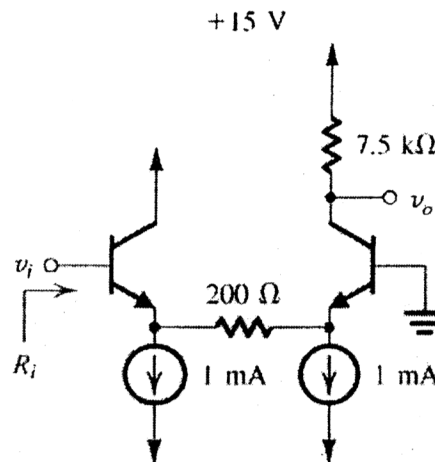


7. Design a first-order op amp-RC high pass filter with a 3-dB frequency of 100Hz, a high frequency input resistance of 100k Ω , and a high-frequency gain magnitude of unity. (10%)

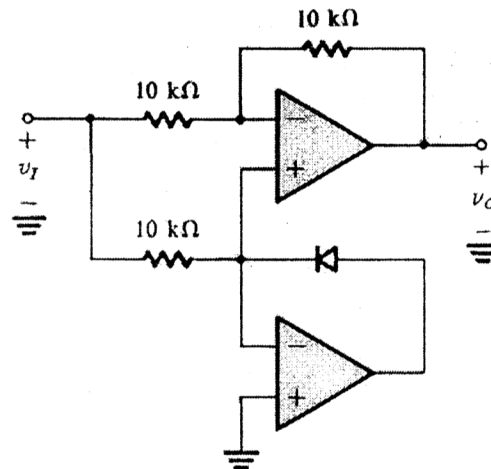
8. Consider the oscillator circuit, and assume for simplicity that $\beta = \infty$. Find the frequency of oscillation and the minimum value of R_C (in terms of the bias current I) for oscillation to start. (10%)



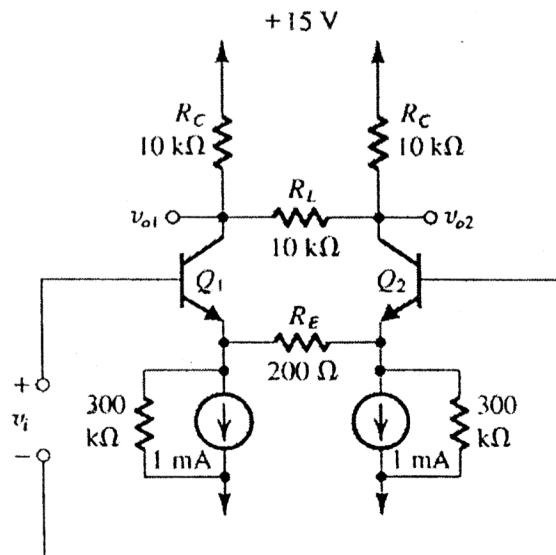
2. Find the voltage gain and input resistance of the amplifier in the following circuit, assuming that $\beta=100$. (10%)



3. Sketch the transfer characteristics of the following circuit. (10%)



4. For the following circuit, assume that all the transistors $\beta=100$ and $V_A=100$ V. (20%)
- (a) Identify and sketch the differential half-circuit and the common-mode half-circuit.
- (b) Find the differential gain, the common-mode gain, the differential input resistance, and the common-mode input resistance.



注意：背面尚有試題