

國立臺北科技大學

九十二學年度機電整合研究所入學考試

電子學試題

填准考證號碼

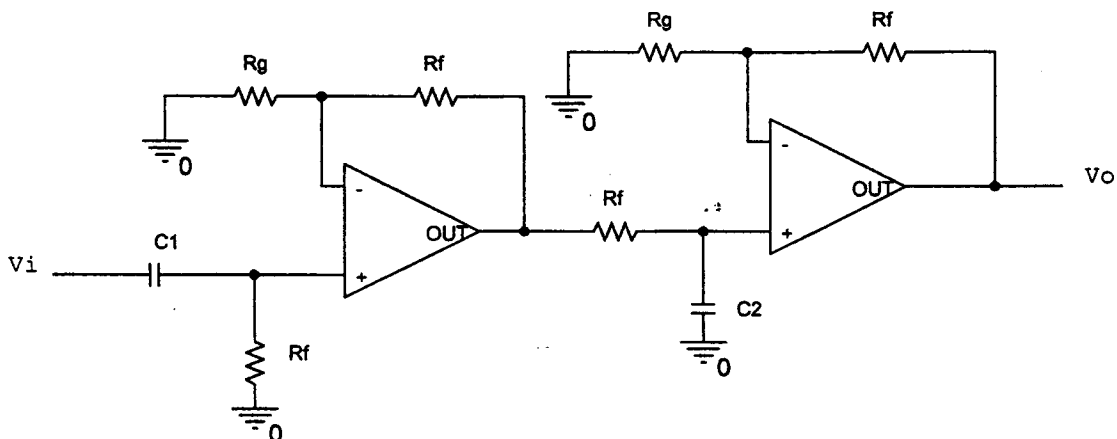
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注意事項：

1. 本試題共 7 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，否則不予計分。

1. A band-pass filter is shown in the below drawing. Assume $R_f = 10\text{k}\Omega$; please find C_1 , C_2 and R_g such that the circuit has corner frequencies at 159.15 Hz and 7.96 kHz also the amplitude magnified 9 times between corner frequencies. (15%)



2. About the work of an n-channel enhancement-type MOSFET, please follow the instructions below. (15%)
- (1) Draw the cross section of the transistor to explain its structure.
 - (2) Draw the cross section again but add some regions to explain the

situation when $0 < V_{GS} < V_T$ (threshold voltage) and $V_{DS} > 0$.

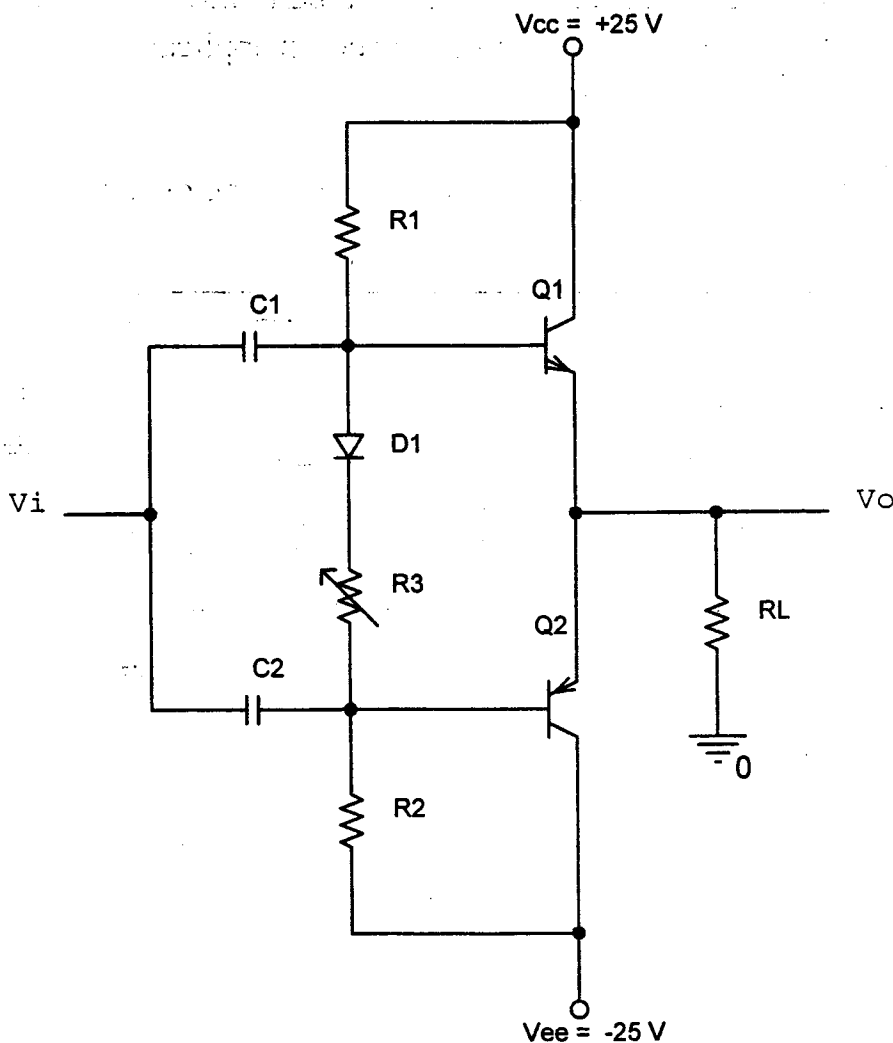
(3) Draw the cross section again but add some regions to explain the situation when $V_{GS} > V_T$ and $V_{DS} > V_{DSAT}$ (saturated voltage).

3. For the class B power amplifier as circuit below, assume that the resistors R1, R2, R3 and the diode are carefully designed to ensure no crossover distortion.

Now if $R_L = 4 \Omega$, please calculate the output power and the circuit efficiency

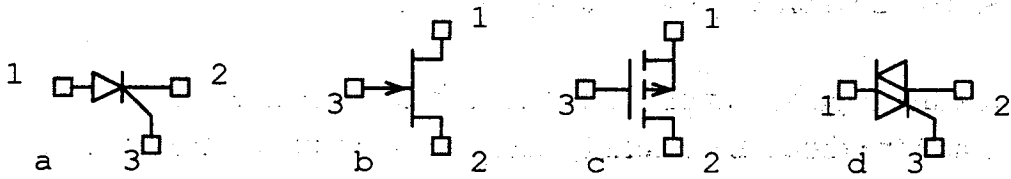
for a sinusoidal input of 12 V_{rms} . In addition, what will be the maximum efficiency based on no distortion and input voltage may subject to change?

(15%)



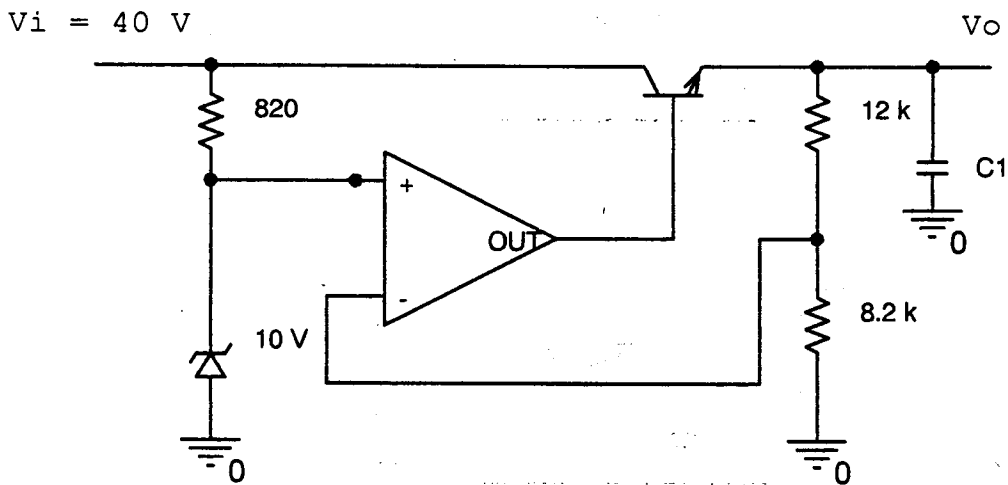
4. For the following four electronic devices, please give the name of each device and its terminals. After that, please draw the I-V curves of terminal 1 to terminal 2 for each device and show the function of terminal 3. (20%)

注意：背面尚有參考資料



5. A TTL IC may equip with one of following outputs, open-collector, totem-pole (or active pull-up) or tristates. Please draw the output circuits of these three types and explain their differences in application. (15%)

6. Please calculate the regulated output voltage of the below circuit. (5%)



7. For the network below, please determine input impedance Z_i , output impedance Z_o and voltage gain A_v by using r_e and r_o models for the transistor in small AC signal analysis and assuming $r_e = 26\text{mV}/I_E$ and $r_o = 50\text{k}\Omega$. (15%)

