

國立臺北科技大學 102 學年度碩士班招生考試

系所組別：1111、1132 機電整合研究所甲、丙組

第二節 電子學 試題 (選考)

第一頁，共二頁

注意事項：

1. 本試題共 9 題，每題配分如試卷所標示，共 100 分。
2. 請標明大題、子題編號作答，請將題目中之電路圖移植於答案紙上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. As the following **Figure(1)**, if the load current and zener current are 65mA and 20mA respectively, please calculate the power dissipation of Zener diode ($V_{ZD}=12V$ and DC power 20 V) and calculate the resistors of R_Z , R_L and power dissipation. (10%)

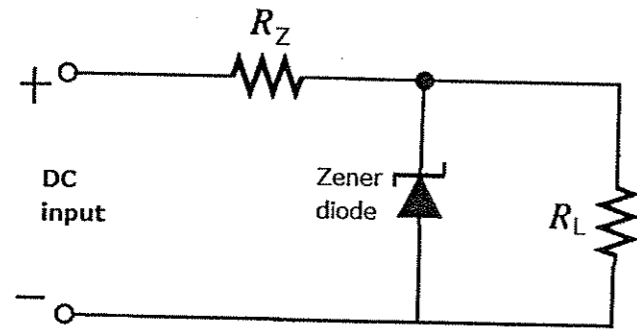


Figure. 1 Zener diode shunt regulator

2. Please describe the main applications of transistor in the electronic circuit or control system. (10%) (If you could, please draw the application electronic circuits.)

3. The input signal in **Figure (2)** is applied to the comparator and R_1 is $2.2 K\Omega$, C is $0.001\mu F$. Please draw waveform and calculate the output voltage to show its proper relationship with the input signal. (10%)

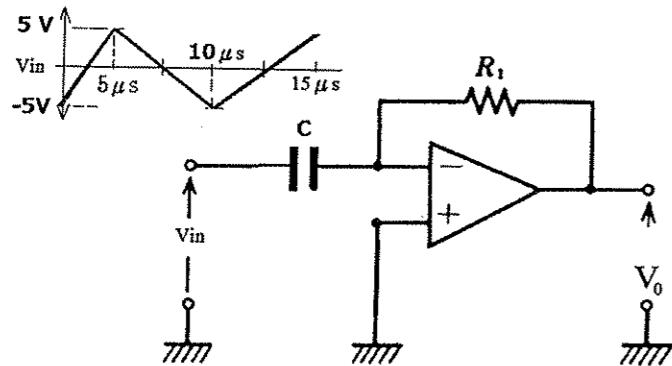


Fig. 2

4. Describe the output waveform for the diode limiter as the following **Figure (3)** and determine the peak output voltage and the average value of output voltage. (10%)

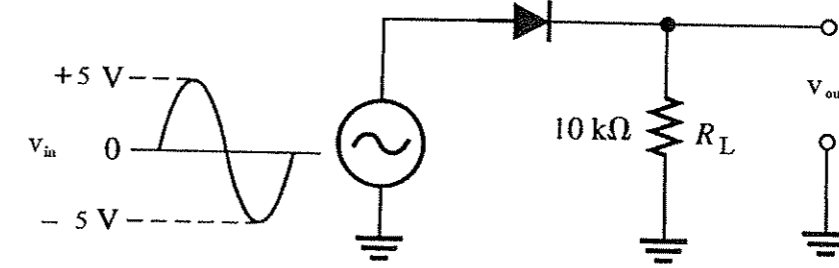


Fig. 3

5. Please answer the following questions as shown in the **Figure (4)**. (15%)
- (a) What is $V_{CE} = ?$ when $V_{in} = 0 V$
 - (b) What minimum value of I_B is required to saturate this transistor if β_{DC} is 150 Neglect $V_{CE(sat)}$
 - (c) Calculate the maximum value of R_B when $V_{IN}=5 V$.

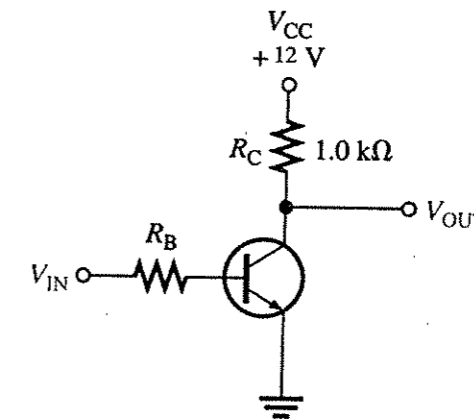


Fig. 4

6. Determine the working voltage value of V_{in} when the transistor becomes saturation condition in the **Figure (5)** (β is 150 of the transistor) (15%)

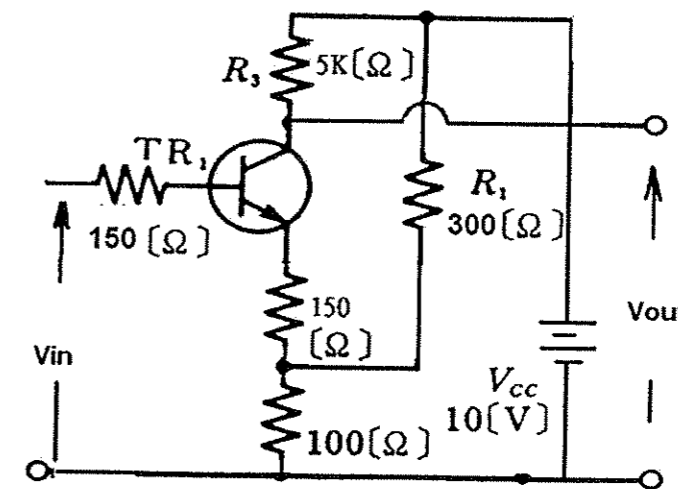


Fig. 5

注意：背面尚有試題

7. Describe the output waveform for the OP-AMPs as the following **Figure (6)** to show its proper relationship with the input signal and determine the peak voltage (V_u) and the low voltage (V_L). (10%)

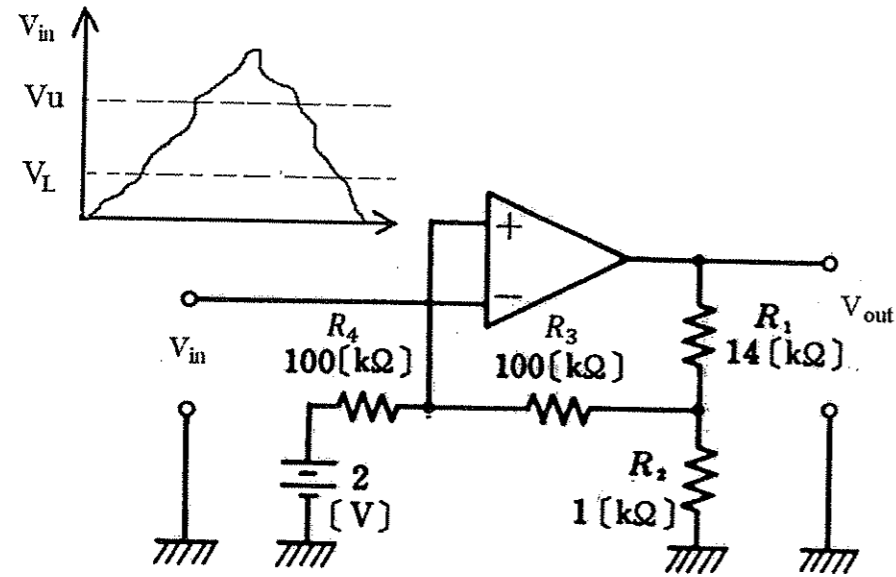


Fig. 6

8. For the circuit in **Figure (7)** (10%)
 (a) Find the mathematical expression for the transient behavior of the voltage V_c and the current i_c if the capacitor initially uncharged and switch is thrown into position 1 at $t=0$ ms
 (b) Plot the waveforms to show its proper relationship with the input signal.

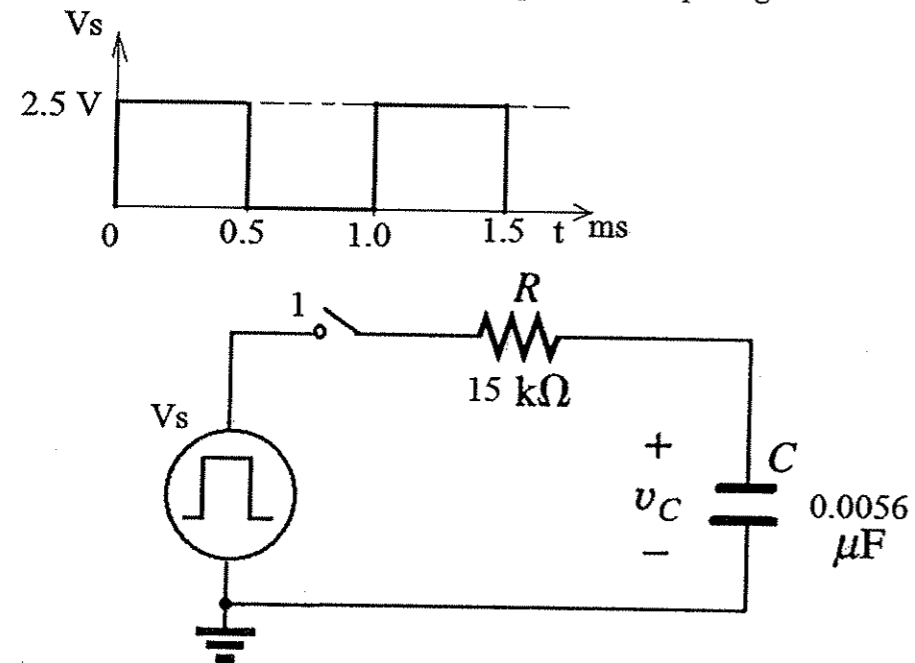


Fig. 7

9. Determine the following for the fixed-bias configuration of **Figure (8)**. (10%)

- (a) I_B and I_C
 (b) V_{CE}
 (c) V_B and V_C

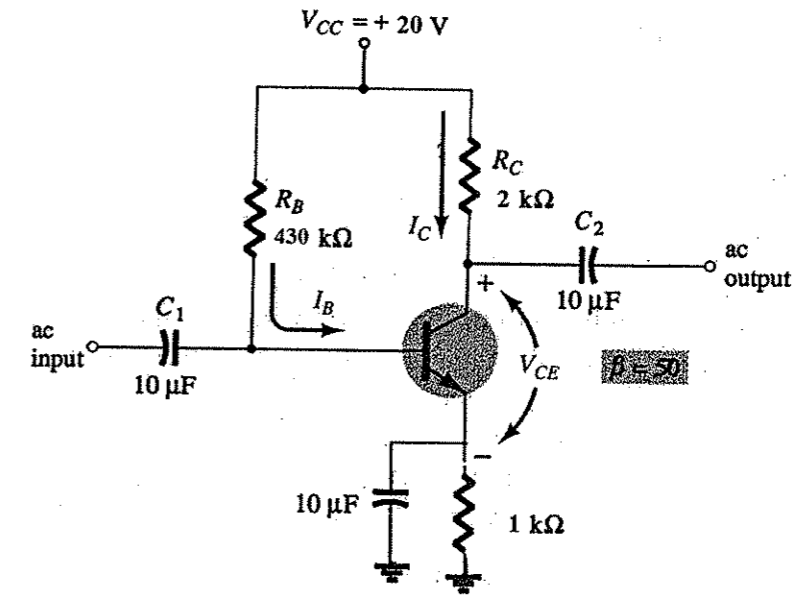


Fig. 8