國立臺北科技大學 101 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）

注意事項：

1. 本試題共 9 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
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. Describe the output wave form for the diode limiter as the following **Figure (1)**. (9%)

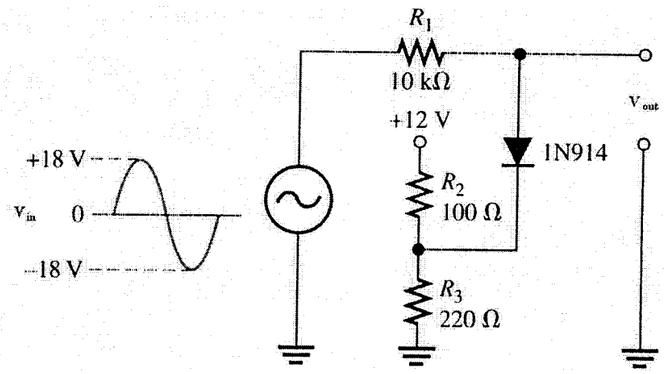

Fig. 1

2. Please answer the following questions as shown in the **Figure (2)**. (15%)
   (a) What is V_{CE} =? when Vin = 0 V
   (b) What minimum value of I_B is required to saturate this transistor if $ß_{DC}$ is 200 Neglect $V_{CE(sat)}$
   (c) Calculate the maximum value of R_B when V_{IN}=5 V.

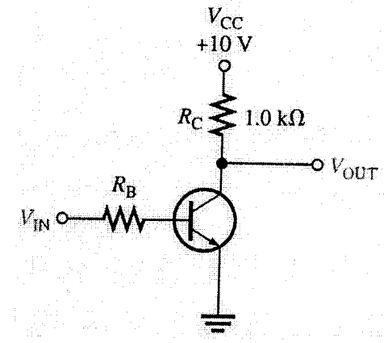

Fig. 2

3. The LED in the **Figure 3** requires 30mA, determine the amplitude of the squire wave input voltage necessary to make sure that the transistor saturates. (if $V_{CE(sat)}$ = 0.3 V, $ß_{DC}$ = 50, V_{LED}= 1.6 V) (10%)

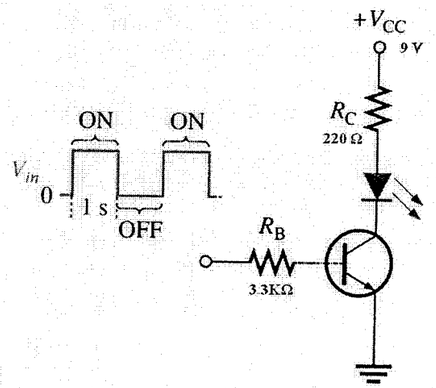

Fig. 3

4. Determine V_{EC} and I_C for the PNP transistor circuit in the **Figure 4** (10%)

注意：背面尚有試題

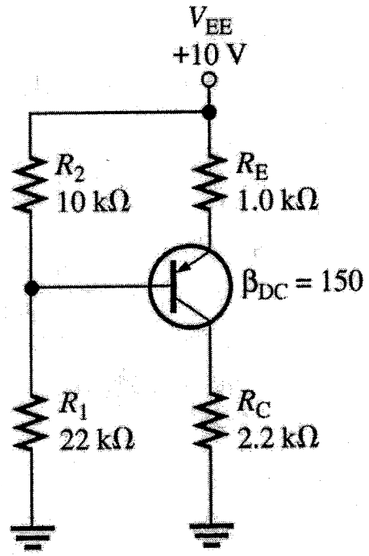

Fig. 4

5. Considering Op-AMPs with negative feedback, Please answer the following questions (Aol: Gain of open-loop OP, Aol is typically large,) (10%)
   (a) As shown in figure 5 (a), determine the Vo=?
   (b) As shown in figure 5(b), determine the Vo=?

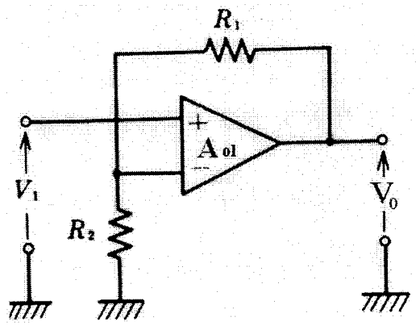

Fig. 5 (a)

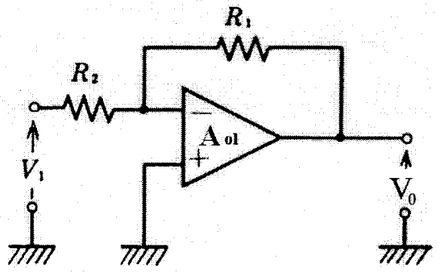

Fig. 5 (b)

6. Derive the Vo as a function $V_1$and V_2 in the following **Figure 6**. (Assume that the gain Aol of OP open-loop is typically large) (10%)

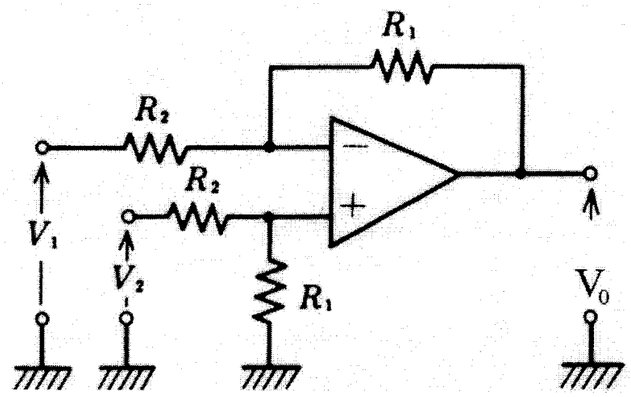

Fig. 6

7. The input signal in **Fig. 7 (a)** is applied to the comparator in the figure 7(b), Please drawing the output showing its proper relationship to the input signal. Assume the maximum output levels of the comparator are ±14V (10%)

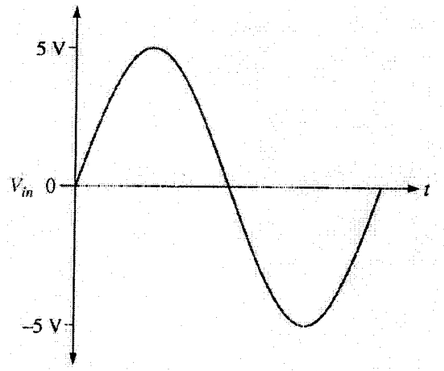

Fig. 7 (a)

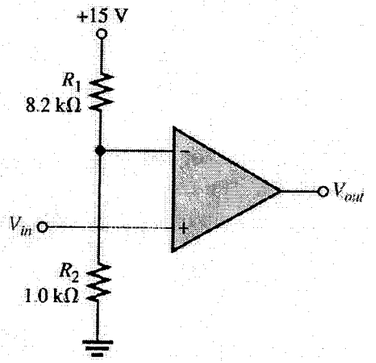

Fig. 7 (b)

8. For the circuit in **Figure 8** (16%)
   (a) Find the mathematical expression for the transient behavior of the voltage Vc and the current ic if the capacitor initially uncharged and switch is thrown into position 1 at t=0 ms
   (b) Find the mathematical expression for the transient behavior of the voltage Vc and the current ic if the capacitor initially uncharged and switch is thrown into position 2 at t=10 ms (Assume that there is no leakage current of capacitor)
   (c) Find the mathematical expression for the transient behavior of the voltage Vc and the current ic if the capacitor initially uncharged and switch is thrown into position 3 at t=20 ms
   (d) Plot the waveforms obtained in the part (a)~(c) on the same time axis using the defined polarities in figure 8.

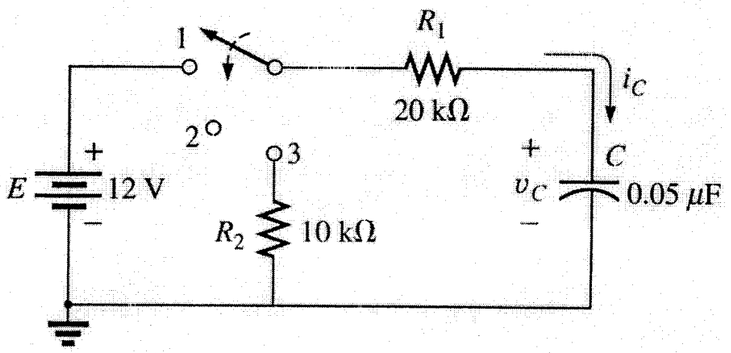

Fig. 8

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

(a) I_B and I_C

(b) V_{CE}

(c) V_B and V_C

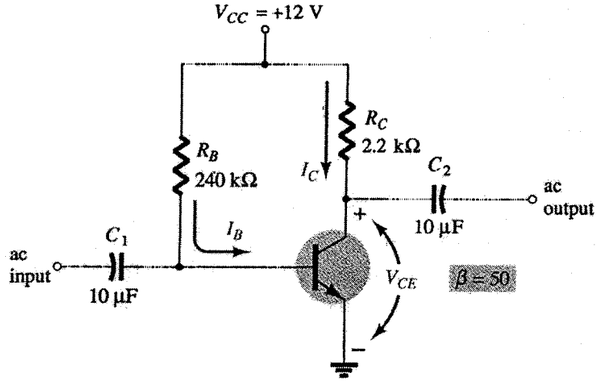

Fig. 9