

國立臺北科技大學

九十四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

第一頁 共二頁

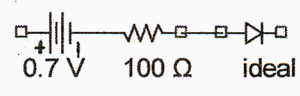
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注意事項：

1. 本試題共 5 大題，第 1 大題為填充題共 60 分，其餘每題各 10 分，共 100 分。
2. 請按順序標明題號作答，不必抄題，數值答案請提供四位有效數字。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. To each of the blanks below, please sequentially put your answers on your answer sheet.
 (@6%*10=60%)

(1) If the diode in Fig. P(1) can be equivalently expressed as



then the voltage across the diode terminals would be 1.1 V.

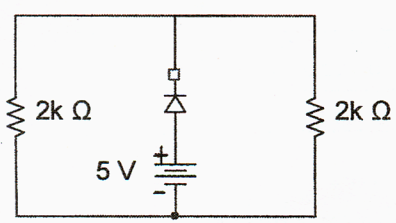


Fig. P(1)

(2) To the Zener diode in Fig. P(2), its power rating should be at least larger than 1.2 mW.

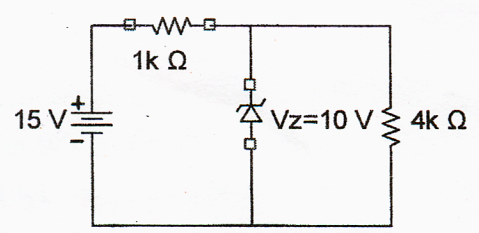


Fig. P(2)

(3) To the transistor in Fig. P(3), the accurate voltage of operating point (or say Q-point), V_{CEQ} , should be 1.3 V.

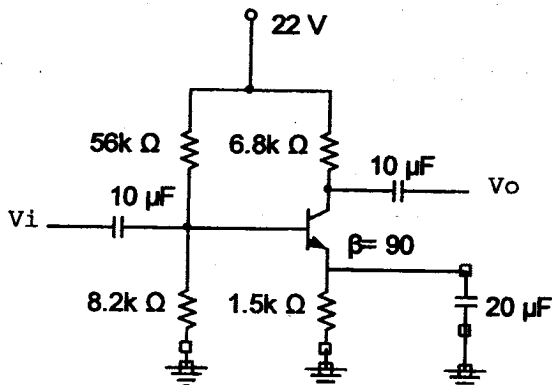


Fig. P(3)

(4) If a large enough reverse voltage is applied on a pn junction diode, an obvious reverse current will be generated due to the mechanisms of Zener effect or/and 1.4.

(5) To the transistor in Fig. P(5), the accurate current of operating point (or say Q-point), I_{DQ} , should be 1.5 mA.

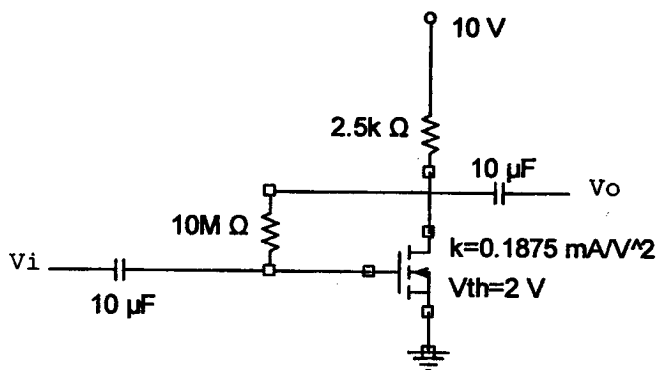


Fig. P(5)

(6) To the circuit in Fig. P(6), the accurate voltage gain, A_V , should be 1.6 based on r_e model ($r_e = 26mV / I_E$) under the assumption of r_o effects can be negligible.

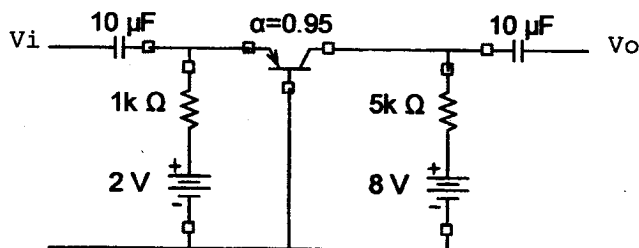


Fig. P(6)

注意：背面尚有試題

(7) If a transfer function $T(s) = \frac{-5}{s + 10}$ is to be implemented by using an active filter as in

Fig. P(7), then the values of R should be 1.7 Ω and C should be 1.8 μF .

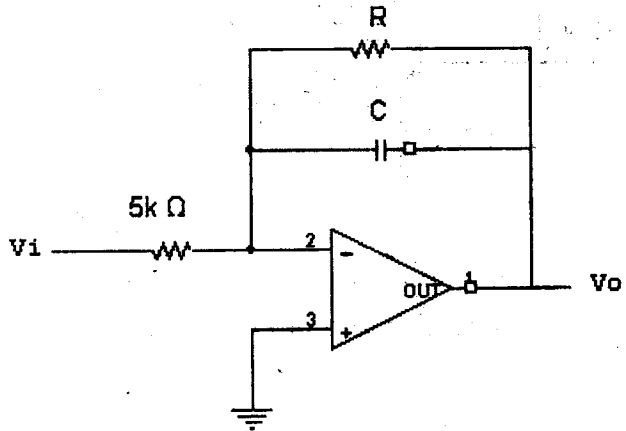


Fig. P(7)

(8) If a half-wave rectified sinusoidal signal is intended to be counted in a digital circuit composed of TTL ICs, the first step is the maximal voltage of the signal should be tuned to be 5 V. Then a logic gate with 1.9 is necessary in conditioning the signal to digital format.

(9) By carefully examining Fig. P(9), we can guess out that the transistor is designed to 1.10.

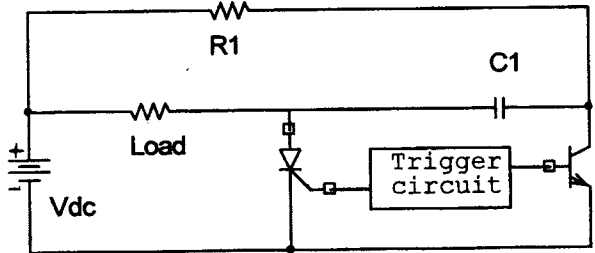


Fig. P(9)

2. Assume you have a 7805 IC and two 1N4004 diodes in hand. Please design a circuit containing above devices to provide a 5VDC/0.5A power source from 110VAC city power. Please also note that you need to properly size all the necessary components. (10%)

3. When using an oscilloscope to measure a sinusoidal signal, if the waveform is drifting (or say running) right or left on the display screen, what is the reason for such an occasion and what tuning processes should be done to reveal a steady waveform. (10%)

4. To the circuit and input waveform shown in Fig. P4, please draw its output waveforms for (a) $f = 10\text{ kHz}$, (b) $f = 500\text{ Hz}$. Please also note that you need to mark out the voltages in each corner of your waveforms. (10%)

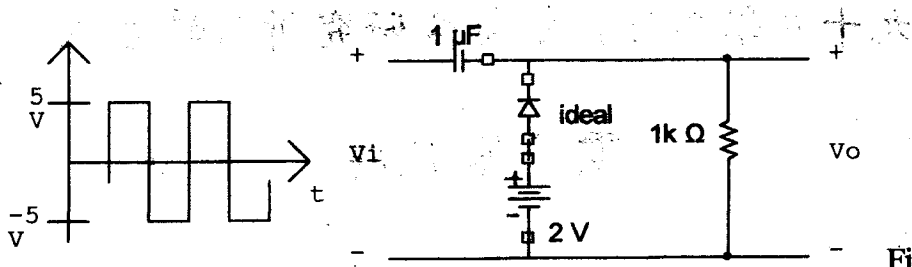


Fig. P4

5. For a p-substrate wafer, please draw a cross section to show the structure of a CMOS inverter used in logic circuits. You should at least draw out all the transistors in their cross sections and apparently show all the necessary wirings to the terminals. (10%)