

國立臺北科技大學 112 學年度碩士班招生考試

系所組別：1502 自動化科技研究所

第二節 電子學 試題 (選考)

第 1 頁 共 2 頁

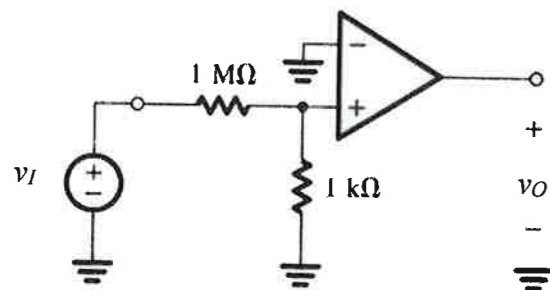
注意事項：

1. 本試題共 5 題，每題 20 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

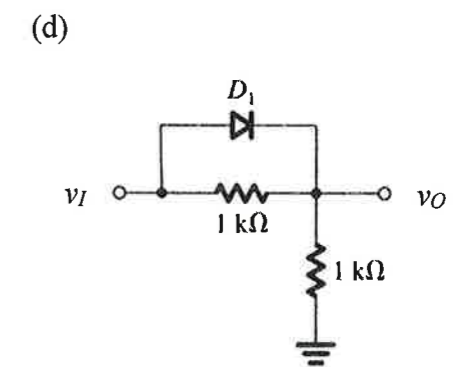
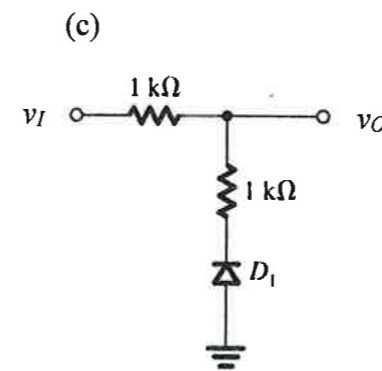
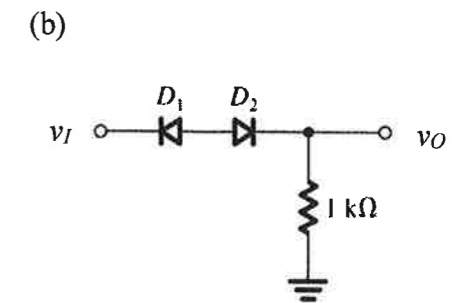
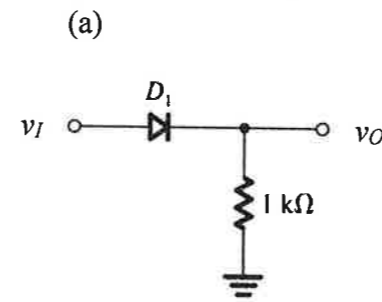
1. Consider a 4-bit digital word $b_3b_2b_1b_0$ in a format called signed-magnitude, in which the most significant bit, b_3 , is interpreted as a sign bit—0 for positive and 1 for negative values. (20%)

- (a) List the values that can be represented by this scheme above. (10%)
- (b) For a particular analog-to-digital converter, each change in b_0 corresponds to a 0.5-V change in the analog input. What is the full range of the analog signal that can be represented? (5%)
- (c) What signed-magnitude digital code results for an input of +2.5 V? (5%)

2. The circuit shown in the following figure uses an op amp that is ideal except for having a finite gain A . Measurements indicate $v_O = 4.0$ V when $v_I = 1.0$ V. What is the op-amp gain A ? (20%)

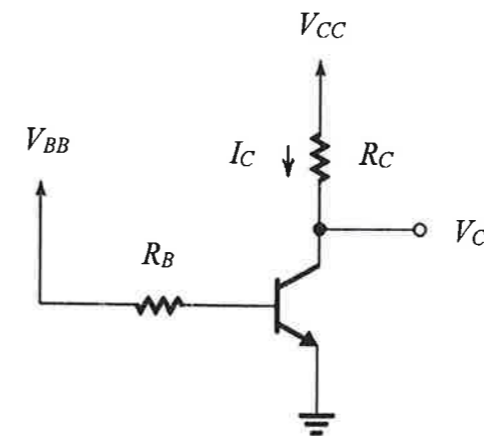


3. In each of the ideal-diode circuits shown as follows, v_I is a 1-kHz, 5-V peak sine wave. Sketch the waveform resulting at v_O , and show its positive and negative peak values. (20% in total; 5% for each)



4. For the circuit shown below, let $V_{CC} = 10$ V, $R_C = 1$ k Ω , and $R_B = 10$ k Ω . The BJT has $\beta = 50$. Find the value of V_{BB} that results in the transistor operating

- (a) in the active mode with $V_C = 2$ V (5%);
- (b) at the edge of saturation (5%);
- (c) deep in saturation with $\beta_{forced} = 10$ (10%). Assume $V_{BE} \approx 0.7$ V. (20%)



注意：背面尚有試題

5. For the following circuit, find V_B and V_E for:

(a) $V_I = +2\text{ V}$ (5%);

(b) $V_I = -5\text{ V}$ (15%). The BJTs have $\beta = 50$. (20%)

