

國立臺北科技大學 113 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 6 題，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。

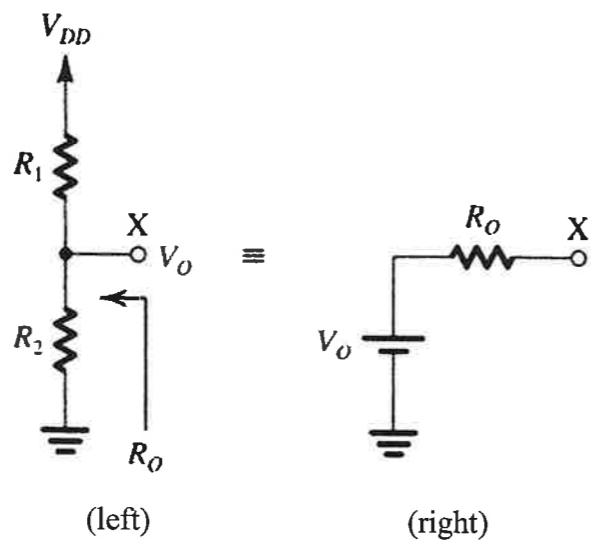
1. Give expressions, $v(t)=V_m \sin(\omega t)$, for the following sine-wave voltage signals. (15%)

- (a) 10-V peak amplitude and 1-kHz frequency (5%)
- (b) 0.2-V peak-to-peak and 2000-rad/s frequency (5%)
- (c) 120-V rms and 60-Hz frequency (5%)

2. The following figure (left) shows a two-resistor voltage divider. Its function is to generate a voltage V_O (which is smaller than the power-supply voltage V_{DD}) at its output node X. The circuit looking back at node X is equivalent to that shown in the following figure (right). Observe that it is the Thévenin equivalent of the voltage-divider circuit. Find expressions for: (10%)

(a) V_O (5%)

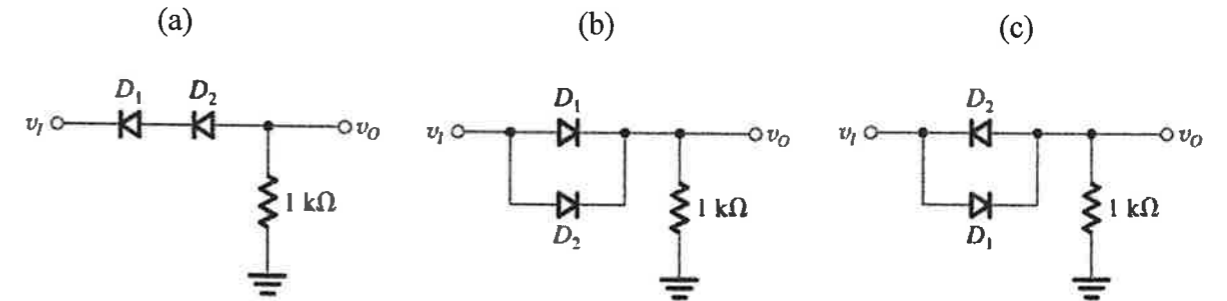
(b) R_O (5%)



3. A full-wave rectifier circuit with a 1-k Ω load operates from a 120-V (rms) 60-Hz household supply through a 6-to-1 transformer having a center-tapped secondary winding. Where, it uses two silicon diodes that can be modeled to have a 0.7-V drop for all currents. (20%)

- (a) What is the peak voltage of the rectified output? (10%)
- (b) What is the average current in the load? (10%)

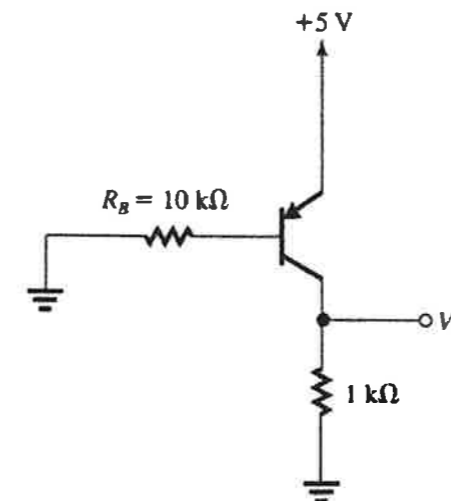
4. In each of the ideal-diode circuits shown as follows, v_I is a 1-kHz, 5-V peak sine wave. Sketch the waveform resulting at v_O , where its positive and negative peak values should be indicated. (15% in total; 5% for each)



5. The *npn* transistor in the circuit below has $\beta=50$. (25%)

(a) Show that the BJT is operating in the saturation mode. (10%)

(b) To what value should R_B be increased in order for the transistor to operate at the edge of saturation? (15%)



注意：背面尚有試題

6. For the following circuit, find V_B and V_E when $V_I = -2.5\text{V}$. Where, the BJTs have $\beta = 50$.
(15%)

