

大葉大學九十五學年度研究所碩士班招生考試試題紙

系 所 別	組 別	考 試 科 目 (中 文 名 稱)	考 試 日 期	節 次	備 註 共二頁 不可釋卷
機電自動化研究所碩士班	甲	電子學或動力學	4月23日	第三節	可使用計算機

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶） 13:30~15:00
 (電子學及動力學任選五題作答，詳列計算步驟，否則一概不給分，答題數不可超過五題，
 第六題以上不予計分，每題 20 分)

- [1] What is Newton's law? Please draw a free body diagram to explain it. 何謂牛頓定理，請繪自由體圖解釋之。
- [2] During a test an elevator is traveling upward at 15m/s shown Figure 1 and the hoisting cable is cut when it is 40 m from the ground. Determine the maximum height s_B reached by the elevator and its speed just before it hits the ground. During the entire time the elevator is in motion, it is subjected to a constant downward acceleration of 9.81 m/s^2 due to gravity. Neglect the effect of air resistance.
- [3] The position vector \vec{r} of the particle P was expressed as the product of the scalar r and the unit vector \vec{i}_r , and written as $\vec{r} = r\vec{i}_r$. Please differentiate(微分) equation $\vec{r} = r\vec{i}_r$ with respect to time to find the velocity and acceleration. [Hint: $d\vec{i}_r/dt = \dot{\theta}\vec{i}_\theta$, $d\vec{i}_\theta/dt = -\dot{\theta}\vec{i}_r$]
- [4] The 10 kg block shown Figure 2 rests on the smooth incline. If the spring originally is unstretched, determine the total work(功) done by all the forces acting on the block when a horizontal force $P = 400 \text{ N}$ pushes the block up the plane $s = 2 \text{ m}$.
- [5] 一個物體質量為 5 kg，必須在一秒被推離 25 cm 外，請問所須之力為何？
- [6] (a)畫一個電路說明何謂分壓定律，(b)利用歐姆定律證明之。
- [7] (a)畫一個利用二極體(假設為理想二極體)所組成的橋式整流器，(b)假設負載為純電阻，試說明其操作原理。
- [8] Consider the amplifier shown in Figure 3:
 (a) Draw the small signal equivalent circuit, (b) Find v_o/v_s
- [9] Consider the circuit in Figure 4, suppose the transistors are both operated in the active mode:
 (a) Calculate the base currents I_{B1} and I_{B2} , (b) Determine the voltages V_3 and V_5 .
- [10] 考慮 Figure 5 之運算放大器電路，設 $V_{cc}=10\text{V}$ 、 $V_1=6\text{V}$ 而且 $V_2=4\text{V}$ (a)當 $V_i=8\text{V}$ 時，那個 LED 會發亮，為什麼？(b)此電路之運算放大器之功能是比较器、放大器、還是史密特觸發器？說明其理由。(c)若此電路之電阻器 $R=300\Omega$ ，功能為何？說明其理由。(d)假設電阻器 R 改變為 $30\text{k}\Omega$ ，對電路之操作有何影響？說明其理由。

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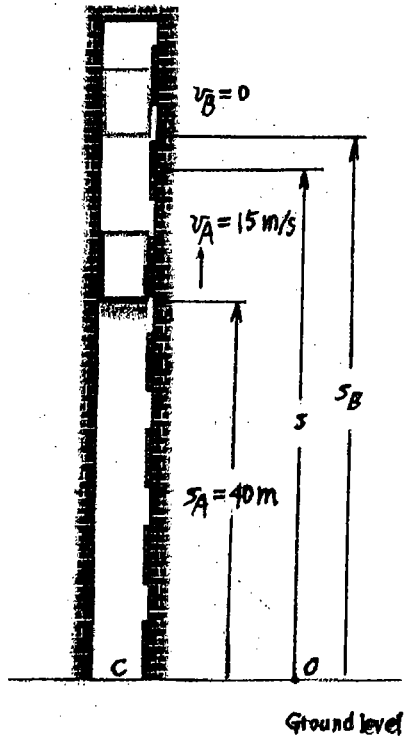


Figure 1. Elevator test

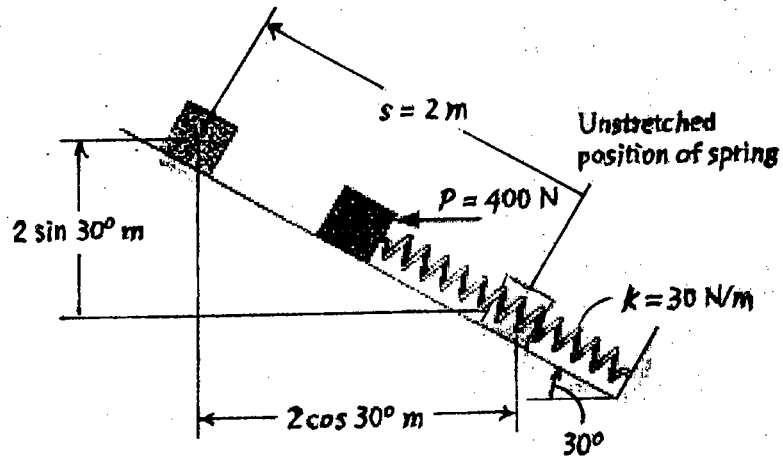


Figure 2. Block spring system

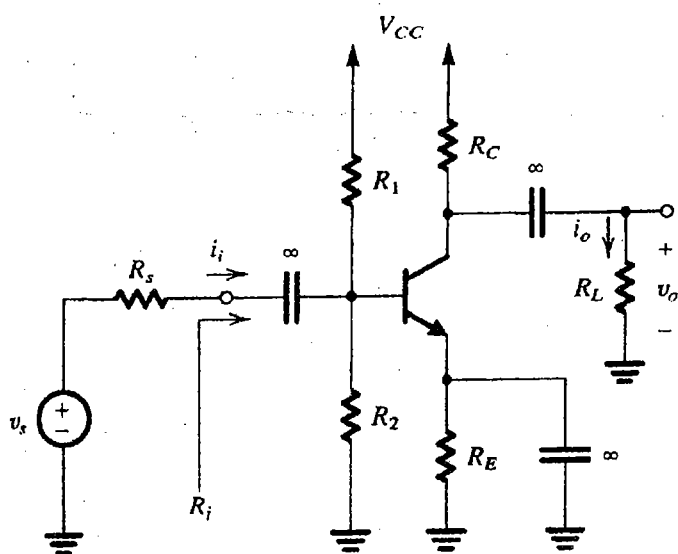


Figure 3. Transistor amplifier

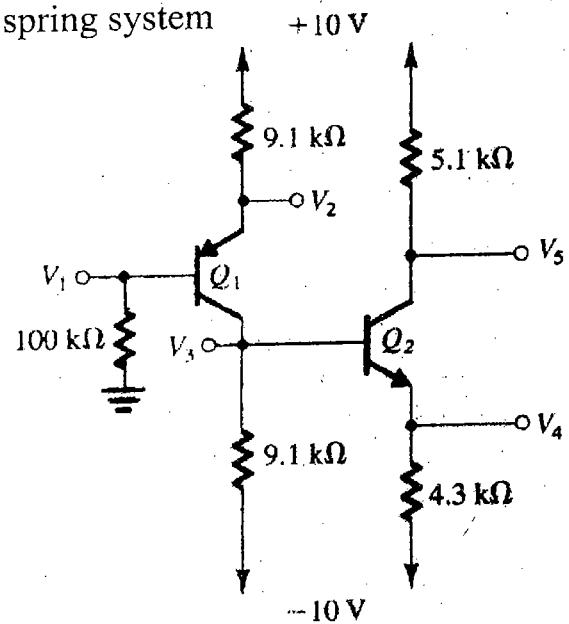


Figure 4. Transistor DC circuit

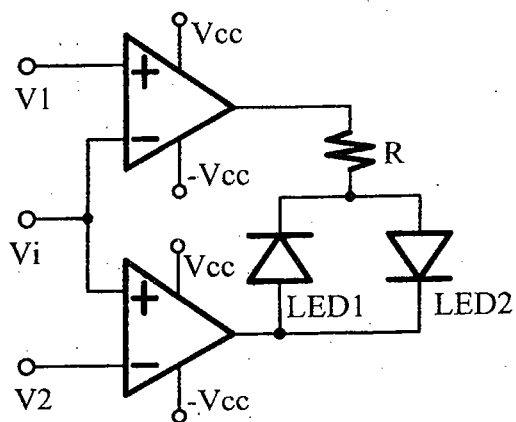


Figure 5. Op-Amp. circuit