

科目：電子學一（元件）

適用：電機系

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

本 試 題

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第 1 頁

編號：341

1. A cellphone receives a signal level of $10\ \mu\text{V}$, but it must deliver a swing of $10\ \text{mV}$ to the speaker that reproduces the voice. Calculate the required voltage gain in decibels. (15 points)
2. A piece of crystalline silicon (Si) is doped uniformly with phosphorus atoms. The doping density is $10^{16}\ \text{atoms/cm}^3$. Determine the electron and hole densities in this material at the room temperature. (15 points)
(Note: intrinsic carrier concentration of Si: $n_i(T = 300\ \text{K}) = 1.08 \times 10^{10}\ (\text{1/cm}^3)$)
3. Please define the following terms.
 - (a) Depletion region (空乏區) of a diode (二極體) (5 points)
 - (b) Drift current (飄移電流) (5 points)
 - (c) Diffusion current (擴散電流) (5 points)
 - (d) N-type doping (N-型摻質) (5 points)
 - (e) P-type doping (P-型摻質) (5 points)
 - (f) Electrons (電子) (5 points)
 - (g) Holes (電洞) (5 points)
 - (h) Zener breakdown (齊納崩潰) (5 points)
 - (i) Avalanche breakdown (雪崩崩潰) (5 points)
 - (j) Junction capacitance (接面電容) of a diode (5 points)
4. (a) For the half-wave rectifier shown in Fig. 1, plot the output waveform for different values of smoothing capacitor C_1 . (10 point)
(b) List the advantages of a full-wave rectifier when compared with a half-wave rectifier. (10 points)

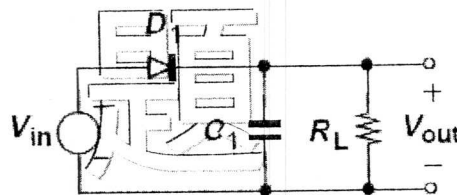


Fig. 1