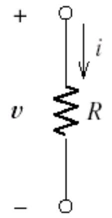
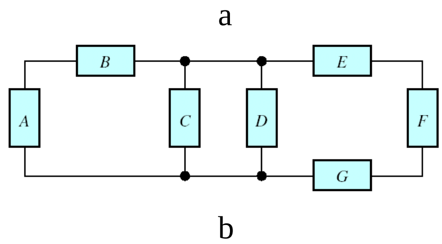
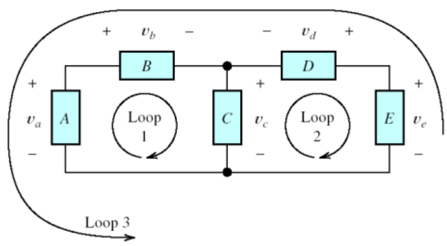
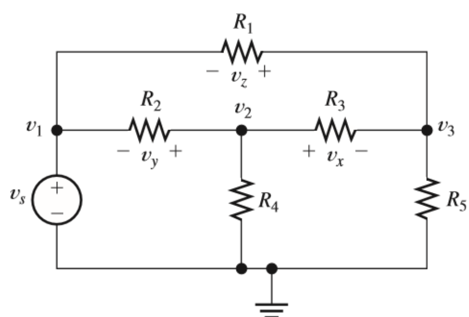
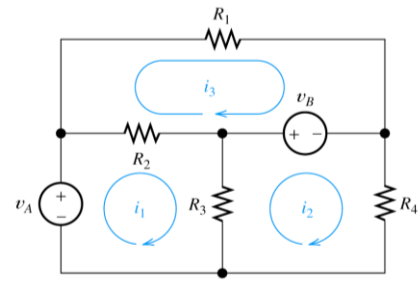
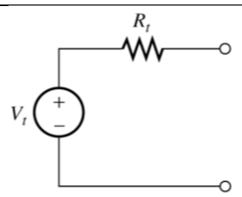
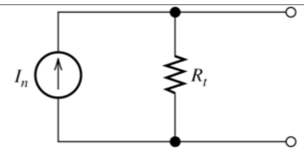
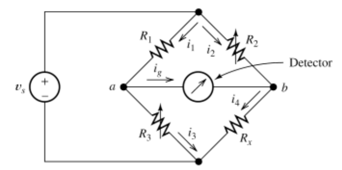
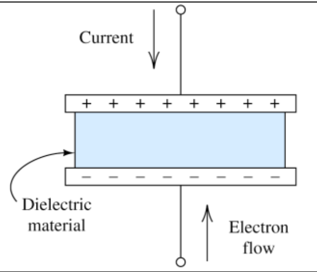
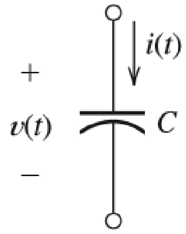
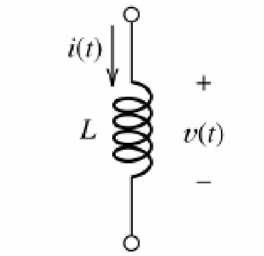
UC《电工电子学》课后综合

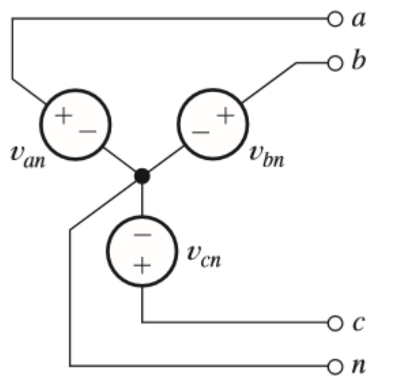
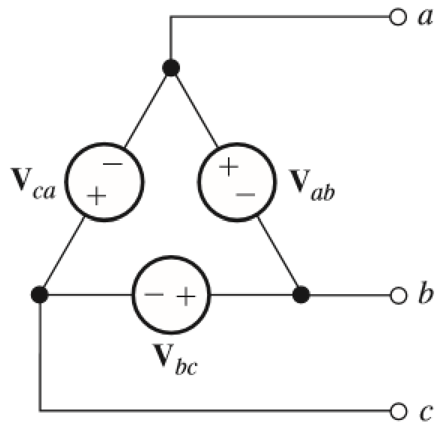
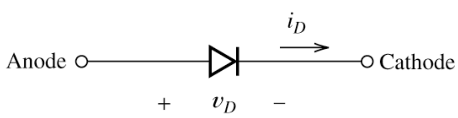
Words and Formula Sheet

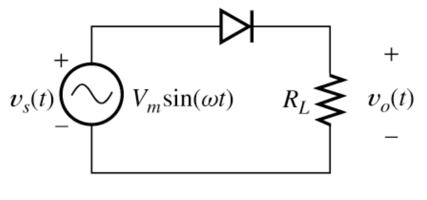
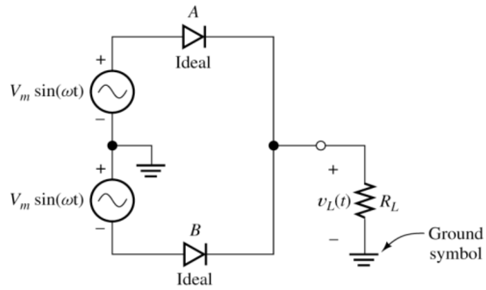
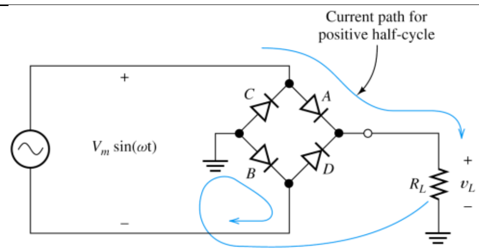
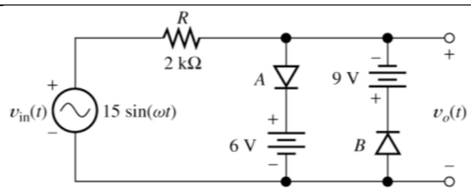
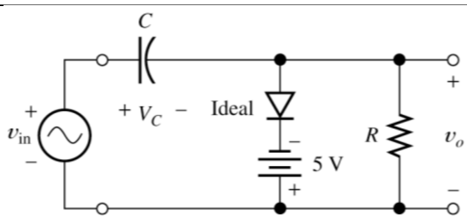
Chapter	Words/Formula	Abbreviations	中文含义	说明
Chapter 1	Electrical Engineering		电气工程	
	Power System		电力系统	在各种形式之间分配和转换能量
	Signal processing system		信号处理系统	收集、储存、处理、运输和呈现信息
	Electrical current $i(t)=\frac{dq(t)}{dt}$ $q(t)=\int_{t_0}^{t} i(t)dt+q(t_0)$	I	电流	电荷流过导体或电路元件的时间速率 单位是安培（A），相当于库仑每秒（C/s）
	Reference direction		参考方向	电流为负值时，电流的流向实际上与参考方向相反
	Direct Current	D.C.	直流电	当电流随时间恒定时，我们称之为直流电，简称直流电
	Alternating Current	A.C.	交流电	一种随时间变化的电流，周期性地反转方向，称为交流电
	Triangular Waveform		三角波	
	Square Waveform		方形波	
	Voltage $V=\frac{W(J)}{Q(C)}$	V	电压	电压是流经元件的每单位电荷所传递的能量 电压单位是伏特（V），相当于焦耳每库仑（J/C）
	Energy $W=QV$ $w=\int_{t_1}^{t_2} p(t)dt$	W	能量	
	Power $p(t)=v(t)i(t)$			
	Passive Reference Configuration		被动参考配置	电流参考进入电压的正极性
	Independent Voltage Source		独立电压源	理想的独立电压源在其端子上保持一个特定的电压
	Dependent Voltage Source		从属电压源	独立或受控电压源与独立电压源相似，不同之处在于通过电源端子的电压是电路中其他电压或电流的函数
	Series Resistance (n=3) $R_{eq}=R_1+R_2+R_3$		串联电阻	

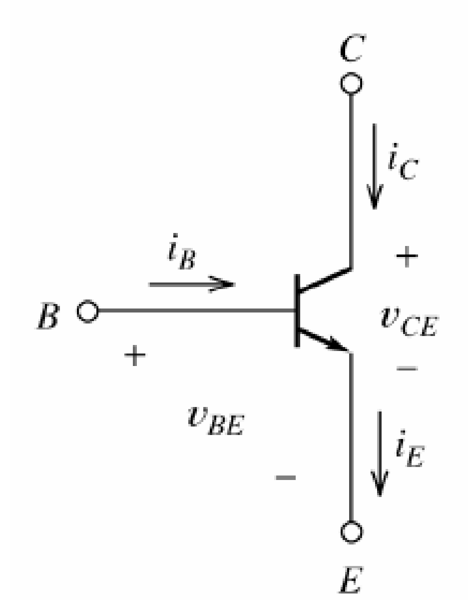
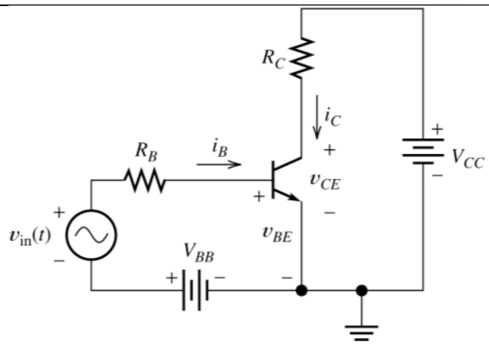
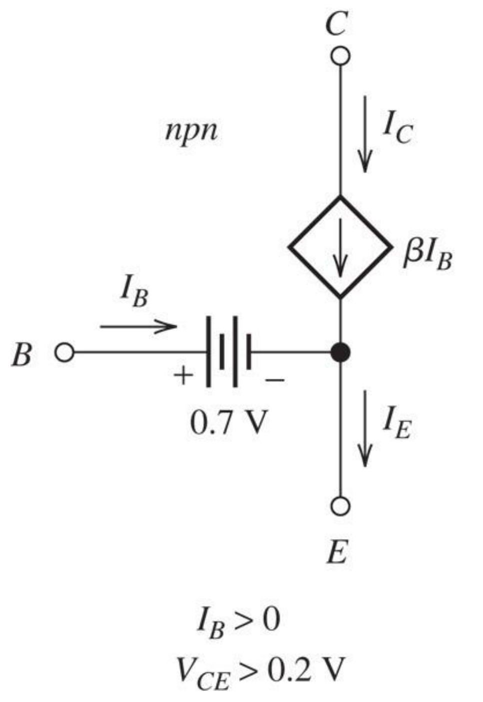
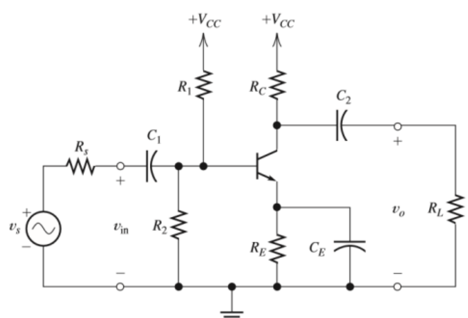
	Parallel Resistance (n=3) $R_{eq} = \frac{1}{1/R_1 + 1/R_2 + 1/R_3}$		并联电阻	
	Voltage Division $v_1 = R_1 i = \frac{R_1}{R_1 + R_2 + R_3} v_{total}$ $v_2 = R_2 i = \frac{R_2}{R_1 + R_2 + R_3} v_{total}$		电压分配	
	Current Division $i_1 = \frac{v}{R_1} = \frac{R_2}{R_1 + R_2} i_{total}$ $i_2 = \frac{v}{R_2} = \frac{R_1}{R_1 + R_2} i_{total}$		电流分配	
	Ohm's Law $v = iR$ $v_{ab} = i_{ab} R$ $v_{ab} = -i_{ba} R$		欧姆定律	
	KIRCHHOFF'S CURRENT LAW **KCL at node a:** $i_1 + i_2 - i_3 - i_4 = 0$ **KCL at node b:** $-i_1 - i_2 + i_3 + i_4 = 0$		基尔霍夫电流定律	进入节点的净电流为零 
	Node		**节点**	两个或多个电路元件连接在一起的点
	KIRCHHOFF'S VOLTAGE LAW		**基尔霍夫电压定律**	电路中任何闭合路径（回路）的电压代数和等于零 
	Loop		**回路**	回路是从一个节点开始，经过电路元件，最后返回起始节点的闭合路径
Chapter 2	**Node-Voltage Analysis** $v_1 = v_s$ $\frac{v_2 - v_1}{R_2} + \frac{v_2}{R_4} + \frac{v_2 - v_3}{R_3} = 0$ $\frac{v_3 - v_1}{R_1} + \frac{v_3}{R_5} + \frac{v_3 - v_2}{R_3} = 0$		**节点电压法**	

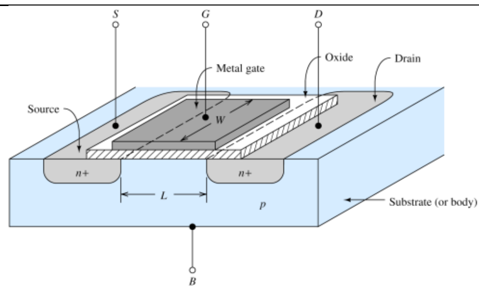
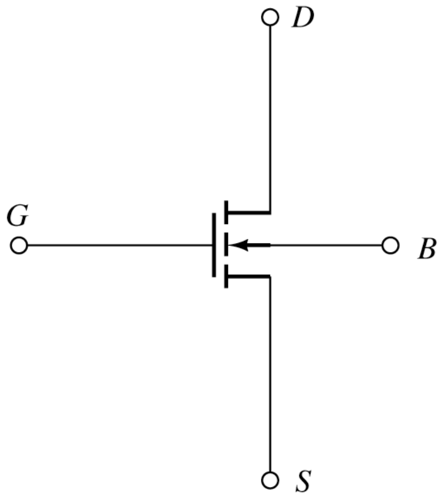
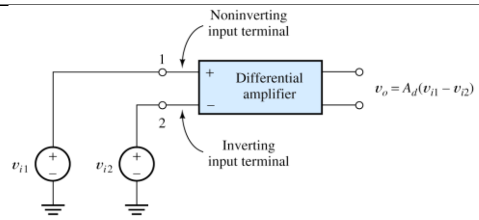
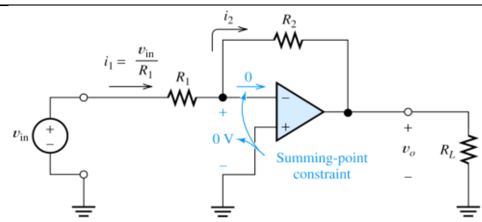
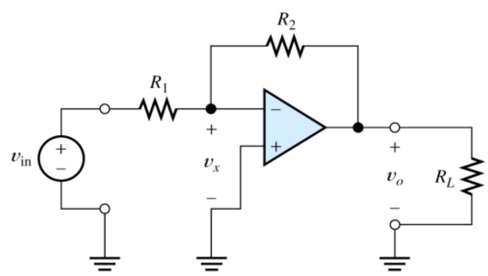
	Reference node		**参考节点**	以地面符号标记。任何可以选择节点作为参考节点。
	Super Node		**超节点**	在两个节点周围画一条虚线，包围一个电压源。
	Mesh Current Analysis $R_2(i_1-i_3)+R_3(i_1-i_2)-v_A=0$ $R_3(i_2-i_1)+v_B+R_4i_2=0$ $R_2(i_3-i_1)+R_1i_3-v_B=0$		**网孔电流法**	
	planar networks		**平面网络**	无需一个元件（或导体）与另一个元件（或导体）交叉即可在平面上绘制的网络。
	branch current		**支路电流**	在网络的每个分支中定义一个单独的电流
	mesh current		**网电流**	我们定义流过网格的电流
	Thévenin Equivalent Circuits		**戴维南等效电路**	
	Norton Equivalent Circuits		**诺顿等效电路**	
	Maximum Power Transfer $P_L=i_L^2R_L=\frac{V_t^2}{(R_t+R_L)^2}\cdot R_L$ $P_{LMax}=\frac{V_t^2}{4R_t}$		**最大功率传输**	
	Superposition Principle $r_T=r_1+r_2+\cdots+r_n$		**叠加原理**	
	WHEATSTONE BRIDGE $R_x=\frac{R_2}{R_1}R_3$		**惠斯通电桥**	 Figure 2.62 The Wheatstone bridge. When the Wheatstone bridge is balanced, $i_g=0$ and $v_{ab}=0$.
Chapter 3	**Capacitor**		**电容器**	当电容器充电时，能量储存在极板之间的电场中。

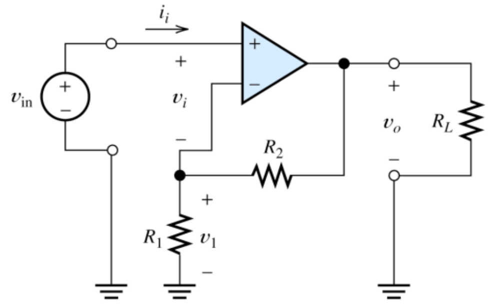
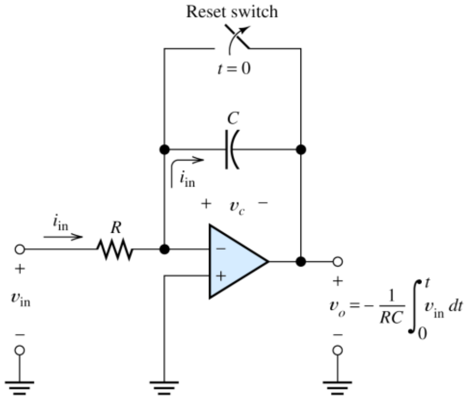
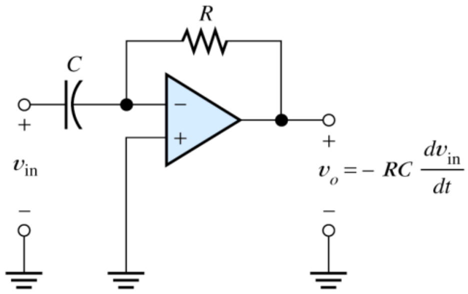
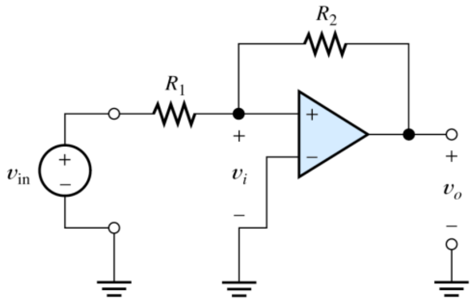
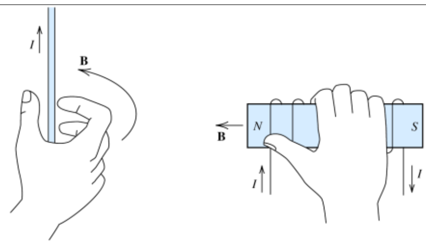
				
	Capacitance $C = \frac{q}{v} \quad q = vC$ $i = \frac{dq}{dt} = \frac{d(Cv)}{dt} = C\frac{dv}{dt}$ $v(t) = \frac{1}{C}\int_{t_0}^{t} i(\tau)\,d\tau + v(t_0)$		电容	
	Inductance $v(t) = L\frac{di}{dt}$		电感	
Chapter 5	**Steady-State Sinusoidal Analysis** $v = V_m \cos(\omega t + \theta)$		稳态正弦分析	
	Period: *T*		周期	
	Frequency: *f* $f = \frac{1}{T} = \frac{\omega}{2\pi}$		频率	
	Angular frequency ω $\omega = 2\pi f$		角频率	
	Phase angle: θ		相位角	
	Peak value: V_m I_m		幅值	
	Roof-Mean-Square $V_{rms} = \frac{V_m}{\sqrt{2}}$ $I_{rms} = \frac{I_m}{\sqrt{2}}$	RMS	有效值	周期波形的均方值（有效值）等于流过 R 欧姆电阻器的直流电的值。它向电阻器提供与周期电流相同的平均功率。
	Complex number： **Rectangular Coordinates** $A = a + jb$ **Polar Coordinates** $A = \lvert A \rvert e^{j\varphi}$		复数 三角坐标系 极坐标系	

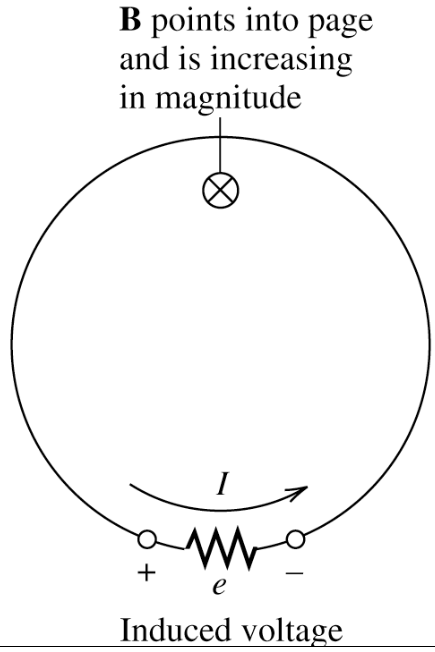
	Phasors $e^{\pm j\phi} = \cos\phi \pm j\sin\phi$		相量	
	Average Power $P = \frac{V_m I_m}{2}\cos(\theta) = V_{rms} I_{rms}\cos(\theta)$ [W]		有功功率	
	Reactive Power $Q = \frac{V_m I_m}{2}\sin(\theta) = V_{rms} I_{rms}\sin(\theta)$ [VAR]		无功功率	
	Apparent Power $V_{RMS} I_{RMS}$ [VA]		视在功率	
	Power angle $\theta = \theta_{voltage} - \theta_{curren}$		功率角	
	Power Factor $PF = \cos(\theta)$	PF	功率因子	
	Power Triangles $P^2 + Q^2 = (V_{rms} I_{rms})^2$		功率三角	
	Balanced three-phase source **Y:** $v_{an}(t) = V_Y cos(\omega t)$ $\mathbf{V}_{an} = V_Y\angle 0^\circ$ $v_{bn}(t) = V_Y cos(\omega t - 120^o)$ $\mathbf{V}_{bn} = V_Y\angle -120^o$ $v_{cn}(t) = V_Y cos(\omega t + 120^o)$ $\mathbf{V}_{cn} = V_Y\angle +120^o$ **Δ:** $v_{ab}(t) = V_Y cos(\omega t)$ $\mathbf{V}_{ab} = V_Y\angle 0^\circ$ $v_{bc}(t) = V_Y cos(\omega t - 120^o)$ $\mathbf{V}_{bc} = V_Y\angle 120^\circ$ $v_{ca}(t) = V_Y cos(\omega t - 120^o)$ $\mathbf{V}_{ca} = V_Y\angle -120^\circ$		平衡三相电源	
	Diodes		二极管	
Chapter 9	**anode**		阳极	
	cathode		阴极	
	Forward-bias region		正向导通区	
	Reverse-bias region		反向截止区	

	Reverse-breakdown region		反向击穿区	
	silicon diodes		硅二极管	
	knee voltage		死区电压	
	saturation current		反向饱和电流	
	load line		负载线	
	operating point		工作点	
	half-wave rectifier		半波整流电路	 (a) Circuit diagram
	Full-wave Rectifier		全波整流	
	Diode–bridge Full-wave Rectifier		桥式全波整流	
	Clipper Circuit		限幅电路	 (a) Circuit diagram
	Clamp Circuit		钳位电路	 (a) Circuit diagram

Chapter 12	**Bipolar Junction Transistors** $i_E = I_{ES}\left[\exp\left(\frac{v_{BE}}{V_T}\right)-1\right]$ $i_E = i_C + i_B$ $\alpha = \frac{i_C}{i_E}$	BJT	双极型晶体管	
	Common-Emitter Amplifier		共射极放大器	
	large-signal dc analysis		大信号直流分析	
	Small-signal equivalent circuits $A_v = \frac{v_o}{v_{in}} = -\frac{R'_L\beta}{r_\pi}$ $A_{voc} = \frac{v_o}{v_{in}} = -\frac{R_C\beta}{r_\pi}$		小信号等效电路	

	$Z_{in} = \frac{v_{in}}{i_{in}} = \frac{1}{1/R_B + 1/r_\pi}$ $A_i = \frac{i_o}{i_{in}} = A_v \frac{Z_{in}}{R_L}$ $G = A_i A_v$ $Z_o = R_C$			
Chapter 11	**NMOS Transistor**		NMOS 晶体管	
	source	**S**	源极	
	gate	**G**	栅极	
	drain	**D**	漏极	
	Body	**B**	衬底	
Chapter 13	**DIFFERENTIAL AMPLIFIERS**		差分放大器	
	Negative feedback		负反馈	
	INVERTING AMPLIFIERS $A_v = \frac{v_o}{v_{in}} = -\frac{R_2}{R_1}$ $Z_{in} = \frac{v_{in}}{i_1} = R_1$		逆变放大器	

	$Z_0 = 0$			
	NONINVERTING AMPLIFIERS		同相放大器	
	INTEGRATOR Circuit $v_o(t) = -\frac{1}{RC}\int_0^t v_{\text{in}}(t)dt$		积分电路	
	Differentiator Circuit $v_o(t) = -RC\frac{dv_{\text{in}}}{dt}$		微分电路	
	Positive Feedback		正反馈	
	Magnetic Fields		磁场	
Chapter 14	**Right-Hand Rule**		右手定则	 (a) If a wire is grasped with the thumb pointing in the current direction, the fingers encircle the wire in the direction of the magnetic field (b) If a coil is grasped with the fingers pointing in the current direction, the thumb points in the direction of the magnetic field inside the coil
	Magnetic flux		磁通量	

	$\phi = \int_A \mathbf{B} \cdot d\mathbf{A}$			
	flux linking a coil with N turns $\lambda = N\phi$		磁链	
	Faraday’s Law $e = \dfrac{d\lambda}{dt}$		法拉第定律	
	Lenz’s Law		楞次定律	
	magnetomotive force	**mmf**	磁动势	
	Reluctance $\mathscr{R} = \dfrac{\ell}{\mu A}$ $\mathscr{F} = \mathscr{R}\phi$		磁阻	
	IDEAL TRANSFORMERS $Z_L' = \dfrac{\mathbf{V}_1}{\mathbf{I}_1} = \left(\dfrac{N_1}{N_2}\right)^2 Z_L$ $v_2(t) = \dfrac{N_2}{N_1} v_1(t)$ $I_{2\mathrm{rms}} = \dfrac{N_1}{N_2} I_{1\mathrm{rms}}$		理想变压器