新编电气与电子信息类本科规划教材

电气工程及其自动化专业英语

Specialized English for Electrical Engineering & Its Automation

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内 容 简 介

本书主要讨论电气工程及其自动化专业英语的阅读与翻译。全书分 4 部分，共计 30 单元，每单元含原文课文、专业英语词汇、课文注释及科技英语阅读与翻译知识等内容。专业内容涵盖电工电子、电机学、电气工程及计算机控制技术等。

本书可作为自动化、电气工程及其自动化、机电工程等专业的专业英语教材，也可供从事相关专业工作的工程技术人员参考。

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前　言

根据电子工业出版社“新编电气与电子信息类本科规划教材”编委会的总体要求精神，遵照“电气工程及其自动化专业英语”课程的教学大纲要求，依据编委会审定通过的“电气工程及其自动化专业英语”教材编写大纲，我们编写了本书。

本书分 4 部分，共计 30 单元。书中的课文全部选自相关英文原版大学教材或专业文献等。每篇课文后列出了课文中新出现的专业词汇，以供学生积累专业词汇之用。同时对课文进行了注释，就课文中出现的较为复杂的语法现象进行了分析和讲解，以帮助学生对课文的理解。最后是科技英语阅读与翻译（系列）知识介绍，以期提高学生的阅读和翻译能力。

本书由南昌大学戴文进教授主编，其主持制订了本书的编写大纲，对全书进行统稿，并编写了第一、第二和第三部分。此外，各单元课文后的科技英语阅读与翻译（系列）知识也由戴文进教授撰写。武汉工业学院杨植新副教授任副主编，并编写了本书的第四部分。

在本书的编写过程中，戴文进教授的在校研究生周伟和刘保彬两位同学参与了资料整理、文字录入、插图绘制及书稿的校对等工作，在此表示衷心感谢。

由于编者水平有限，加之时间仓促，书中难免有不少疏漏和不当之处，敬请读者不吝指教，我们将不胜感谢。

编著者

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Part 1　Electrics and Electronics

Unit 1　Circuit Elements and Parameters

1.1　Text

An electric circuit (or network) is an interconnection of physical electrical devices. The purpose of electric circuits is to distribute and convert energy into some other forms. Accordingly, the basic circuit components are an energy source (or sources), an energy converter (or converters) and conductors connecting them.

An energy source (a primary or secondary cell, a generator and the like) converts chemical, mechanical, thermal or some other forms of energy into electric energy. An energy converter, also called load (such as a lamp, heating appliance or electric motor), converts electric energy into light, heat, mechanical work and so on.

Events in a circuit can be defined in terms of e.m.f. (or voltage) and current. When electric energy is generated, transmitted and converted under conditions such that the currents and voltages involved remain constant with time, one usually speaks of direct-current (D.C.) circuits.【1】

With time-invariant currents and voltages, the magnetic and electric fields of the associated electric plant are also time-invariant. This is the reason why no e.m.f.s of self- (or mutual-) induction appear in D.C. circuits, nor are there any displacement currents in the dielectric surrounding the conductors.

Fig.1.1 shows in simplified form a hypothetical circuit with a storage battery as the source and a lamp as the load. The terminals of the source and load are interconnected by conductors (generally but not always wires)【2】. As is seen, the source, load and conductors form a closed conducting path. The e.m.f. of the source causes a continuous and unidirectional current to circulate round this closed path.

This simple circuit made up of a source, a load and two wires is seldom, if ever, met with in practice. Practical circuits may contain a large number of sources and loads interconnected in a variety of ways【3】.

To simplify analysis of actual circuits, it is usual to show them symbolically in a diagram called a circuit diagram, which is in fact a fictitious or, rather, idealized model of an actual circuit of network. Such a diagram consists of interconnected symbols called circuit elements or circuit parameters. Two elements are necessary to represent processes in a D.C. circuit. These are a source of e.m.f. E and of internal (or “source”) resistance R_S, and the load resistance (which includes the resistance of the conductors) R (Fig.1.2)

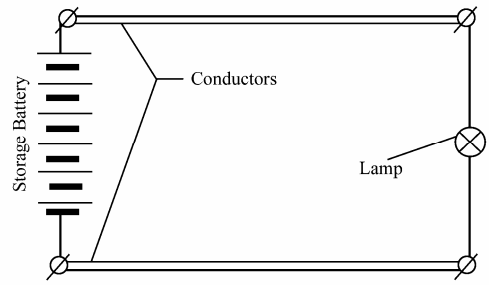


Fig.1.1

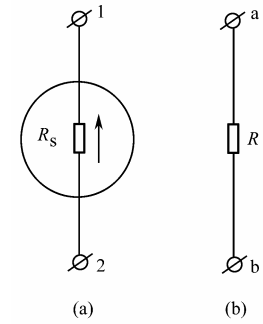


Fig.1.2

Whatever its origin (thermal, contact, etc.), the source e.m.f. E (Fig.1.2 (a)) is numerically equal to the potential difference between terminals 1 and 2 with the external circuit open【4】, that is, when there is no current flowing through the source

$$E = \varphi_1 - \varphi_2 = V_{12} \tag{1.1}$$

The source e.m.f. is directed from the terminal at a lower potential to that at a higher one. On diagram, this is shown by arrows.

When a load is connected to the source terminals (the circuit is then said to be loaded) and the circuit is closed, a current begins to flow round it. Now the voltage between source terminals 1 and 2 (called the terminal voltage) is not equal to its e.m.f. because of the voltage drop V_S inside the source, that is, across the source resistance R_S

$$V_S = R_S I$$

Fig.1.3 shows a typical so-called external characteristic $V = \varphi_1 - \varphi_2 = V(I)$ of a loaded source (hence another name is the load characteristic of a source).As is seen, increase of current from zero to $I \approx I_1$ causes the terminal voltage of the source to decrease linearly

$$V_{12} = V = E - V_S = E - R_S I$$

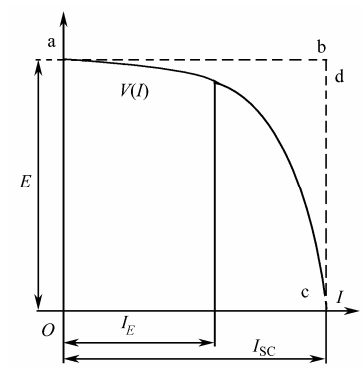


Fig.1.3

In other words, the voltage drop V_S across the source resistance rises in proportion to the

current. This goes on until a certain limit is reached. Then as the current keeps rising, the proportionality between its value and the voltage drop across the source is upset, and the external characteristic ceases to be linear. This decrease in voltage may be caused by a reduction in the source voltage, by an increase in the internal resistance, or both.

The power delivered by a source is given by the equality

$$P_S=EI \tag{1.2}$$

where P_S is the power of the source.

It seems relevant at this point to dispel a common misconception about power. Thus one may hear that power is generated, delivered, consumed, transmitted, lost, etc. In point of fact, however, it is energy that can be generated, delivered, consumed, transmitted or lost. Power is just the rate of energy input or conversion, that is, the quantity of energy generated, delivered, transmitted etc per unit time. So, it would be more correct to use the term energy instead of power in the above context. Yet, we would rather fall in with the tradition.

The load resistance R (Fig.1.2(b)),as a generalized circuit element, gives an idea about the consumption of energy, that is ,the conversion of electric energy into heat, and is defined as

$$P=RI^2 \tag{1.3}$$

In the general case, the load resistance depends solely on the current through the load, which in fact is symbolized by the function $R(I)$.

By Ohm's law, the voltage across a resistance is

$$V=RI \tag{1.4}$$

In circuit analysis, use is often made of the reciprocal of the resistance, termed the conductance, which is defined as

$$g=1/R$$

In practical problems, one often specifies the voltage across a resistance as a function of current $V(I)$,or the inverse relation $I(V)$ have come to be known as volt-ampere characteristics.

Fig.1.4 shows volt-ampere curves for a metal-filament lamp $V_1(I)$, and for a carbon-filament lamp $V_2(I)$. As is seen, the relation between the voltage and the current in each lamp is other than linear. The resistance of the metal-filament lamp increases, and that of the carbon-filament lamp decreases with increase of current.

Electric circuits containing components with non-linear characteristic are called non-linear.

If the e.m.f. and internal resistances of sources and associated load resistances are assumed to be independent of the current and voltage, respectively, the external characteristic $V(I)$ of the sources and the volt-ampere characteristic $V_1(I)$ of the loads will be linear(Fig.1.5).

Electric circuits containing only elements with linear characteristic are called linear.

Most practical circuits may be classed as linear. Therefore, a study into the properties and analysis of linear circuits is of both theoretical and applied interest.

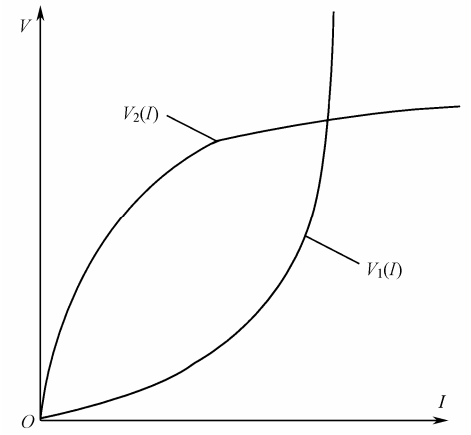


Fig.1.4

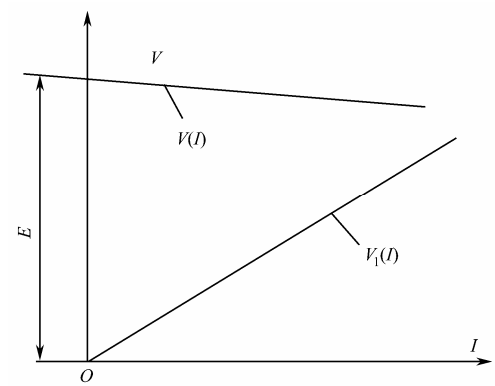


Fig.1.5

1.2 Specialized English Words

circuit components **电路元件**
circuit parameters **电路参数**
electric circuit **电路**
electrical device **电气设备**
electric energy **电能**
energy source **电源**
primary cell **原生电池**
secondary cell **再生电池**
energy converter **电能转换器**
conductor **导体**
generator **发电机**
heating appliance **电热器**
direct-current(D.C.) circuit **直流电路**
magnetic and electric field **电磁场**
time-invariant **时不变的**
self-(or mutual-)induction **自（互）感**
displacement current **位移电流**
the dielectric **电介质**
storage battery **蓄电池**
wire **导线**
e.m.f.＝electromotive force **电动势**
unidirectional current **单方向电流**
circuit diagram **电路图**
load characteristic **负载特性**
terminal voltage **端电压**
external characteristic **外特性**
load resistance **负载电阻**
voltage drop **电压降**
conductance **电导**
volt-ampere characteristics **伏安特性**
metal-filament lamp **金属丝灯泡**
carbon-filament lamp **碳丝灯泡**
non-linear characteristics **非线性特性**

1.3 Notes

【1】When electric energy is generated, transmitted and converted under conditions such that the currents and voltages involved remain constant with time, one usually speaks of direct-current (D.C.) circuits.**这是一个主从复合句，“** when…time **”，是一个由** when **引导的时间状语从句，“** one…circuits **”是整个句子的主句。只是在从句中又包含了一个由** such that **引导的结果状语从句，该从句的主语是** the currents and voltages, involved **是它的后置定语，意为“牵涉到的，涉及到的”，**remain **是系动词做谓语，结果状语从句是系表结构。因此，整句翻译成“当电能在产生、传输和变换时，若电路中相关的电流和电压不随时间而变化，我们便称其为直流**

电路。”可以看到，结果状语从句并未直接译出。我们在此采用了翻译方法中的“转换法”，将其转译成条件状语从句，这样中文的译文更地道。

【2】The terminals of the source and load are interconnected by conductors(generally but not always wires).**句中的** generally but not always wires =generally wires, but not always wires,**意为“通常这种导体是导线，但少数情况下也有例外。”**

【3】This simple circuit made up of a source, a load and two wires is seldom, if ever, met with in practice.=This simple circuit made up of a source, a load and two wires is seldom met with in practice, if it is ever met with in practice sometimes.**意为“这种由一个电源、一个负载和两根导线组成的简单电路在实践中即使有时能遇到，也是很少见的。”**

【4】Whatever its origin (thermal, contact, etc.), the source e.m.f. *E* (Fig 1.2 (a)) is numerically equal to the potential difference between terminals 1 and 2 with the external circuit open. **句中的** between terminals 1 and 2 **说明** difference,**而** with the external circuit open **则修饰** terminals 1 and 2, **因此此句译为“无论图** 1.2（a）**中的电动势** *E* **的原动力是什么（即不论是热的、机械的还是其他什么形式），其大小就等于** 1、2 **两端之间的开路电压。”**

1.4 科技英语阅读与翻译知识——英汉语言之对比（1）

1. 英汉语言之共同处

① 从语言的起源和产生的规律来说，英汉两种语言都具有人类语言的共同特征。

尽管在关于语言的产生过程究竟如何，原始语言的主要形态如何，以及人类语言始于何时等这样一些问题上，至今尚无定论或记载。但有一点是肯定的，那就是语言是人类在自身的进化以及生活、生产及社会活动中，由于交流思想和情感的需要而逐渐产生的。语言是人类所特有的，它遵从人类共同的活动规律和认识规律。因此，人类的语言具有许多共同特征。

我们知道，语言的形成有两大原则：一是随意性，二是规律性。所谓语言的随意性就是：一种说法刚出现时是随意的，但当其为社会全体成员所接受，人人都这么说时，便成了语言。所谓语言的规律性就是：语言的结构（包括词的构成、句子结构及表达方式等）又往往要遵循一定的规律，也就是要符合语法规则。包括英汉两种语言在内的人类所有的语言都具有这种共同特征，即语言既是随意的，又是规范的。此外，人类语言的共同特征还有：语言是行为、语言以声音为媒介、语言是分级的、语言是变化的、语言存在组合和选择关系，以及语言之间具有相似的结构等。

人类语言的共性，是两种语言（包括英语和汉语）之间翻译的基础。

② 从语言与逻辑思维的关系来说，英汉两种语言的语序都符合人类逻辑思维的自然顺序，即句子的结构都是按照：

S（**主语**）+V（**谓语动词**）+O（**宾语**）

的基本模式排列的。

例如在英语中有：

We study English.

在汉语中相应的也有：

我们学英语。

正是这种相似之处，才使英汉之间直译的翻译形式得以存在。

③ 从语言的基本类型来说，英汉两种语言基本同属分析性语言，其词形的变化都比较少。

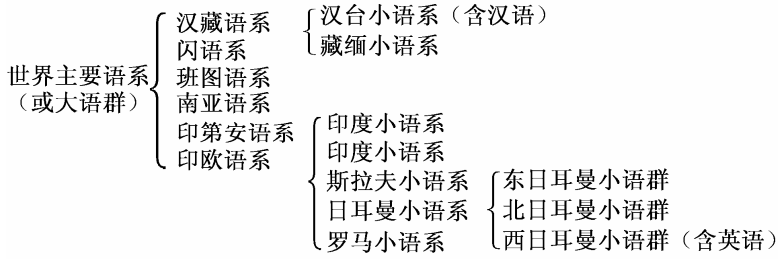
从语言的语法结构上说，世界上的各种语言分为综合性语言和分析性语言两大类。英语的词形变化很少，主要依靠词序，或者通过虚词和某些语言习惯来表示各语法成分之间的关系，基本属于分析语言。而汉语根本就没有词形的变化，可以说是纯粹的分析语言。正是英汉两种语言之间的这种共性，为英汉之间的翻译提供了很多便利。

但凡事都有两面性，正因为英语基本属于分析性语言，因此，其句子结构不尽严谨，特别是在一些复杂的长句中，句子各成分之间以及各子句之间的相互关系不够明确，有时不太容易从语法结构上加以辨识，而往往要借助句子的具体含义来进行分析，这便使得我们在学习英语和从事英汉翻译工作的过程中常常遇到不少困难。

2. 英汉语言之差异

（1）在语源上分属不同的语系

全世界共有六千多种语言（其中亚洲 2165 种，欧洲 225 种，非洲 2011 种，美洲 1000 种，大洋洲及其附近岛屿 1302 种）。这些语言分为若干种语系（Language Family），其中主要有汉藏语系、印欧语系、闪语系、班图语系、南亚语系及印第安语系等大语系。这些大语系又分若干小语系乃至小语群，其如下列所示：



由上列可知，英语属印欧大语系中的日耳曼小语系中的西日耳曼小语群，而汉语则属汉藏语系中的汉台小语系。可见，英汉这两种语言在语源上相距甚远。

（2）在文化上存在着巨大差异

语言不是单纯的交际工具，它是文化的起源，又植根于文化之中，是民族文化的一个重要组成部分。它传达文化反映文化，随文化的变化而变化，随文化的发展而发展。同时语言也因文化的多样性而异彩纷呈。不同的文化，其在语言上存在着很大的文化差异。英汉两种语言在文化上的差异主要表现在以下几个方面。

① 词义的文化差异

词汇是语言中最活跃和最富有弹性的成分，也是文化载荷量最大的成分。一个民族语言的词汇，是其特有的物质环境、社会结构及精神信仰等的集中反映。不同语言中的词汇，有各自特有的文化背景、使用场合和文化内涵。所以，从严格意义上说，英汉两种语之间很难找到所谓的“对应词”。

有了这种理解，便可深刻理解翻译的含义。两种语言之间的翻译过程，决不是其间字词的对译。

② 语法的文化差异

不同语言的语法结构，有不同的思维原则做指导。汉语的语法准则是“达意”，其强调“意合”；而英语的语法准则则是“完形”，其强调“形合”。因此，汉语语法对词的形式和顺序等没有太多的特别要求，句中成分的位置往往可以相互调换。而英语语法则注重形式上的

联系，它往往通过词形的变化，或用各种连词或介词等来表现词与词之间的关系，通过句子成分的“各居其位”来体现意义。

此外，汉语的语法特点注重“时间顺序”，叙事往往通过多个动词或动词词组的连用，按时间的先后和事理的推移，来一件一件地描述事物，讲究“时序连贯”。而英语的构句特点是以谓语动词为核心，用包括非限制性动词短语在内的各种形式的短语或从句等，来“构筑”句子框架，讲究“空间层次”。

③ 语篇的文化差异

所谓语篇，是指大于句子且意义完整的语言单位，如一篇文章或一次谈话等。不同的语言由于其文化思维模式的不同，在组织语篇的方式上是各不相同的。英语的行文方式是“直线型”，即以主题句开头，后接例证句，最后总结；或者反过来，先是例证句，最后以主题句结尾。英文行文直接，强调严密的逻辑推理，讲究一个“实”字。而汉语的行文方式是“螺旋型”的，即不直接论证主题，而是“旁征博引”，往往是古人怎么说，名人怎么说，圣人怎么说等，从各种外围角度论证主题，讲究一个“华”字。

Unit 2　Ideal Sources Series and Parallel Equivalent Circuits

2.1　Text

Consider an elementary circuit containing a single source of e.m.f. E and of internal resistance R_S, and a single load R (Fig.2.1). The resistance of the conductors of this type of circuit may be neglected. In the external portion of the circuit, that is, in the load R, the current is assumed to flow from the junction a (which is at a higher potential such that $\varphi_a = \varphi_1$) to the junction b (which is at a lower potential such that $\varphi_b = \varphi_2$). The direction of current flow may be shown either by a hollow arrowhead or by supplying the current symbol with a double subscript whose first digit identifies the junction at a higher potential and the second the junction at a lower potential【1】. Thus for the circuit of Fig.2.1, the current $I=I_{ab}$.

We shall show that the circuit of Fig.2.1 containing a source of known e.m.f. E and source resistance R may be represented by two types of equivalent circuits.

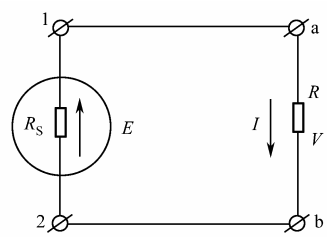


Fig.2.1

As already started, the terminal voltage of a loaded source is lower than the source e.m.f. by an amount equal to the voltage drop across the source resistance

$$V = \varphi_1 - \varphi_2 = E - V_S = E - R_S I \tag{2.1}$$

On the other hand, the voltage across the load resistance R is

$$V = \varphi_a - \varphi_b = RI \tag{2.2}$$

Since $\varphi_1 = \varphi_a$ and $\varphi_2 = \varphi_b$, from Eqs.(2.1) and (2.2) it follows that $E - RI = RI$, or

$$E = R_S I + RI \tag{2.3}$$

and

$$I = E/(R_S + R)$$

From the last equation we conclude that the current through the source is controlled by both the load resistance and the source resistance. Therefore, in an equivalent circuit diagram the source resistance R may be shown connected in series with the load resistance R. This configuration may be called the series equivalent circuit (usually known as the Thevenin equivalent source).

Depending on the relative magnitude of the voltages across R and R, we can develop two modifications of the series equivalent circuit. In the equivalent circuit of Fig.2.2(a), V is controlled by the load current and is decided by the difference between the source e.m.f. E and the voltage drop V. If $R_S << R$ and, for the same current, $V_S << V$ (that is, if the source is operating under conditions very close to no-load or an open-circuit), we may neglect the internal voltage drop, put $V_S = RI = 0$(very nearly) and obtain the equivalent circuit of Fig.2.2(b). What we have got is a source whose internal resistance is zero (R=0). It is called an ideal voltage source. In diagrams it is symbolized by a circle with an arrow inside and the letter E beside it. When applied to a network, it is called a driving force or an impressed voltage source. The terminal voltage of an ideal voltage source is independent of the load resistance and is always equal to the e.m.f. E of the practical source it represents. Its external characteristic is a straight line parallel to the x-axis (the dotted line ab in Fig.1.3). The other equivalent circuit in Fig.2.3 may be called the parallel equivalent circuit (usually known as the Norton equivalent). It may also have two modifications. To prove this, we divide the right- and left-hand sides of Eq.(2.3) by R_S

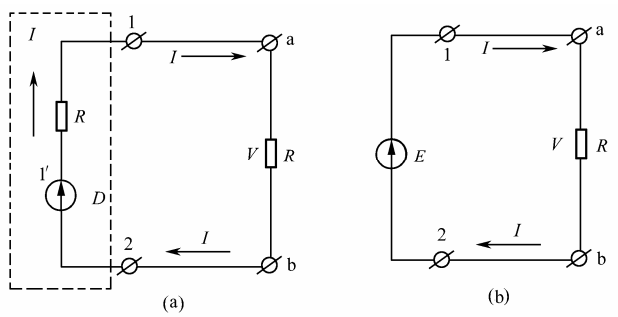


Fig.2.2

$$E/R_S = I + V/R_S = I + Vg_S$$

or

$$J = I + I_S \tag{2.4}$$

where $J = E/R_S$ current with the source short-circuited (with R=0);

$I_S = V/R_S = Vg_S$ current equal to the ratio of the terminal source voltage to the source resistance;

$I = V/R = Vg$ load current.

Eq.(2.4) is satisfied by the equivalent circuit of Fig.2.3(a) in which the source resistance R_S is placed in parallel with the load resistance R.

If $g_S << g$ or $R_S >> R$ and, for the same voltages across R_S and R, the current $I_S << I$ (that is, if the source is operating under conditions approaching a short-circuit), we may put $I_S = Vg_S = 0$(very nearly) and get the equivalent circuit of Fig.2.3(b).

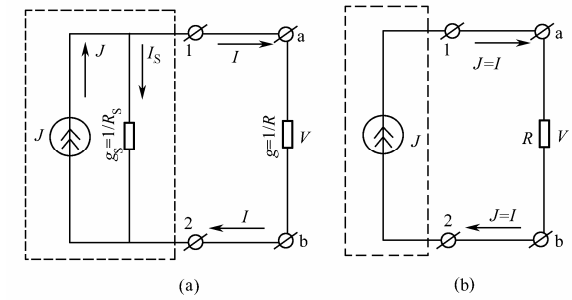


Fig.2.3

What we have got is a source of zero internal conductance, $g_S = 0$($R_S = \infty$). It is called an ideal current source. When applied to a circuit, it is called a driving force of an impressed current source. The current of an ideal current source is independent of the load resistance R and is equal to E/R_S. The external characteristic of an ideal current source is a straight line parallel to the y-axis (the dotted line cd in Fig.1.3.

Thus whether a real energy source may be represented by an ideal voltage source or an ideal current source depends on the relative magnitude of R_S and R. A real source, though, may be represented by an ideal voltage or current source also when R_S is comparable with R. In such a case, either R_S, or $g_S = 1/R_S$ (Fig.2.2 (a) and Fig.2.3(a), respectively) should be removed from the source and lumped with R or $g = 1/R$.

Ideal voltage and current sources are active circuit elements, while resistances and conductance are passive elements.

In developing an equivalent circuit, it is important to take into account, as much as practicable, the known properties of each device and of the circuit as a whole.

Let us develop an equivalent circuit for a two-wire power transmission line of length I, diagrammatically shown in Fig.2.4 (a). There is a generator of e.m.f.E and of source resistance R_S at the sending end and a load of resistance R_2 at the receiving end of the line.

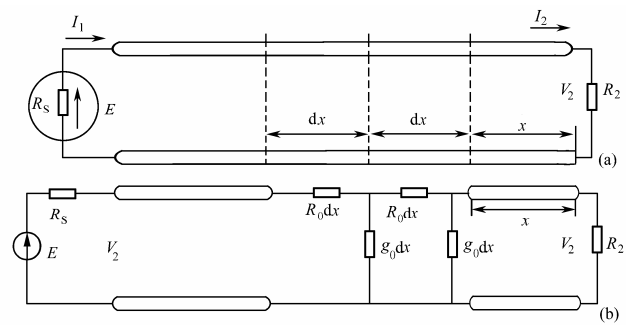


Fig.2.4

It is obvious that the receiving end voltage will be less than the sending end one by an amount equal to the voltage drop across the resistance of the line conductors. The current at the receiving end will be smaller than that at the sending end by an amount equal to the leakage current (due to imperfect insulation).

Let each line conductor have a resistance $R_0/2$ and a conductance g_0 per unit length of the line.

We divide the line into length elements dx (Fig.2.4(a)). Then each length element will have associated with it the combined resistance of the "go" and "return" wires, $R_0\mathrm{d}x=(R_0/2)\mathrm{d}x+(R_0/2)\mathrm{d}x$ and a conductance $g_0\mathrm{d}x$【2】. Accordingly, the entire line may be represented by a network of elements each of resistance $R_0\mathrm{d}x$ and conductance $g_0\mathrm{d}x$ (Fig.2.4 (b)). The sending end generator in this network is represented by a voltage source (of e.m.f. E and of source resistance R_S).

From this equivalent circuit we can find the voltage and current at any point on the line in terms of specified voltage and current at the sending or receiving end.

If the leakage current of the line is only a small fraction of the load current, we may neglect it and remove all conductance $g_0\mathrm{d}x$ from the network. This will leave us with a simple, single-loop network with one and the same current in each of its elements, such as shown in Fig.2.5, where the line resistance $R_{line}=R_0l$ is connected in series with R_S and R_2. The network of Fig.2.5 may be used for analysis of line performance without a consideration of leakage currents.

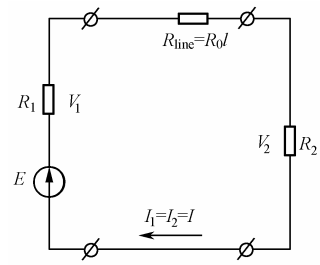


Fig.2.5

It takes some practice to learn to develop equivalent circuits such as will reflect the behavior of physical prototypes in the most faithful manner and meet the requirements of the problem at hand【3】.

2.2 Specialized English Words

ideal source **理想电源**
series and parallel equivalent circuit **串并联等值电路**
internal resistance **内阻**
double subscript **双下标**
ideal voltage source **理想电压源**
ideal current source **理想电流源**
active circuit elements **有源电路元件**
passive circuit elements **无源电路元件**
power transmission line **输电线**
sending end **发送端**
receiving end **接收端**
leakage current **漏电流**

2.3 Notes

【1】The direction of current flow may be show either by a hollow arrowhead or by supplying the current symbol with a double subscript whose first digit identifies the junction at a higher potential and the second the junction at a lower potential.**此句是一个主从复合句，主语是“**The direction of…a double subscript**”，意为“电流的方向既可以用一个空心的箭头，也可以用带有双下标的电流符号来表示”，只是为了定义这个双下标符号，用了一个由** whose **引导的定语从句来修饰** a double subscript,**这个从句从** whose **起一直到句末，其本身实际上是一个并列句，前一个子句是** first digit identifies the junction at a higher potential, **其中** first digit **是主语，** identifies **是谓语，** at a higher potential **是介词短语做** the junction **的后置定语，本子句的意思是“第一个数字表示相对高电位的那一点”。后面那一部分实际上是另一个子句的省略部分，即** the second the junction at a lower potential=the second digit identifies the junction at a lower potential,**因为其句子中的谓语动词在前一子句中已出现，且此两个子句在形式上完全相同，故将其谓语动词省略。**

【2】Then each length element will have associated with it the combined resistance of the “go” and “return” wires, $R_0\mathrm{d}x=(R_0/2)\mathrm{d}x+(R_0/2)\mathrm{d}x$ and a conductance $g_0\mathrm{d}x$.**此句应该翻译成“这样，一长度元将含有与其相关的、含有‘去’与‘来’两段的组合电阻（即** $R_0\mathrm{d}x=(R_0/2)\mathrm{d}x+(R_0/2)\mathrm{d}x$**）和电导** $g_0\mathrm{d}x$**。”**

【3】It takes some practice to learn to develop equivalent circuits such as will reflect the behavior of physical prototypes in the most faithful manner and meet the requirements of the problem at hand.**此句的主句是** It takes some practice to learn to develop equivalent circuits, **其中** to learn to develop equivalent circuits **是不定式短语做主语，只是由于其太长，若放在句首会给人头重脚轻的感觉，所以用** It **做形式主语。 其次要了解此句是“** It takes something（time, money and so on）… **”的句型，此处是** practice**，其意思是“（这件事）是要花一些时间，要花一些实践，要花一些工夫的”。这样主句的意思就是“要学会画（这样的）等值电路是要花一番工夫的。”那么是什么样的等值电路呢？后面整个都是由** such as (that)**引导的定语从句，修饰** equivalent circuits,**意为“既能以最可靠的方式反映实际电路的运行情况，又能满足常常遇到的实际问题需要的这样一种等值电路”。**

2.4 科技英语阅读与翻译知识——英汉语言之对比（2）

（3）在表达方式和语言习惯上存在着差异

① 在表意手法上的差异

就总体而言，英语谓语动词形态稳定、范围宽广、表意功能规范；而汉语则受源远流长的历史传统和汉民族特有的语言心理因素的影响，动词不重形态。谓语动词的时态、语态和语气可以用词语手段来表示，也可以不以任何形式表现出来，只是随情景和上下文而定。所谓“尽在不言之中”，就是这个意思。可以说，汉语是一种在形式（形态）上呈弱势的语言；而英语则相反，其谓语动词形式变化多样而严谨。因此我们说，英语依靠形态表意，即以曲折式形态变化所含的语法意义表意；而汉语则主要靠词汇表意，即用所择词的含义表意。如汉语若要表达“一个已经调制好的电压”这样一个概念，就在“电压”前加上“已调制的”这个词来表达。这样，最后的表达形式便为“已调制的电压”；而当其用英语表示时，“已经调制”中的“已经”这个概念是用动词的过去分词的语法功能来表示的，其表示为：modulated voltage**。其中，过去分词** modulated**，就是动词** modulate **经形态变化后的形式，它在语法上**

就有“已经”和“被”的含义。

再比如，英语中表示主语和谓语动词之间处于“被动关系”（即受事者＋行为，Recipient + Action）而不是“主动关系”（即施事者＋行为，Doer + Action）的形式有其固定的模式，即

Subject（主语）＋be(各种形态变化)＋Past Participle（动词的过去分词式）

在英语中，这种形态表示程式非常稳定、明确、规范，致使被动语态成为一个界定十分清楚的语法范畴；而在汉语中，表示被动关系主要是通过运用某些如“被”、“由”、“受”等词汇来表示。

② 在词义的可塑性上的差异

a. 英语词义比较灵活，词的涵义范围比较宽，富于变化，其词义对上下文的依赖性比较大，独立性比较小。学过英语的人一定会有这样的感觉，即英语是一种适应性和可塑性比较强的语言。其实，它的适应性和可塑性最突出的，就是表现在其词义的灵活性上。而其词义的灵活性，又突出表现为“一词多义”（Polysemy）。此外，其词义很大程度上视词的联立关系而定。词的联立关系不同，其涵义也就不同。英语中有句名言，叫“Words do not have meanings；people have meaning for words.（词本无义，义随人生。）”讲的就是这个意思。

b. 汉语则不同，汉语源远流长，千锤百炼。历史上诸子百家的许多弟子，就以毕生精力专门从事汉语词的诠注工作。这就使得汉语形成了用词讲究精确、规范和严谨的这种特殊的文化和历史传统。因此，汉语的词义比较严谨，词的涵义范围比较窄、比较精确和固定，词义的伸缩性和对上下文的依赖性比较小，独立性比较大。

③ 在词类使用的习惯上的差异

英语中惯用名词，名词又可修饰名词。但英语中动词较少（动词的变体除外），一个句子只能有一个谓语动词；而汉语则惯用动词，一个句子可有几个谓语动词。如：

The control unit of an electronic computer causes the machine to operate according to man’s wish.

电子计算机的控制单元使机器按人的意志运转。

该英语原句中只有一个动词 cause，而汉语的译文中竟出现了“使”、“按（照）”和“运转”3 个动词。

此外，汉语中的代词、连词和介词等使用得远比英语要少。

④ 在代词的使用问题上的差异

英语的代词使用频率比汉语要高得多。这是因为，首先英语中每个句子，包括其中的分句都需要一个主语，而名词多数是只在第一次出现时才使用，以后重复使用时均用代词，因此，英语中人称代词用得很多。如：

As soon as a positive charge approaches an electron, it combines with the latter.

正电荷一接触到电子，便马上与其结合。

句中，在 a positive charge 第二次出现时，便用人称代词 it 替代。

此外，为明确所属关系，英语一定要用物主代词，但汉语则不然。如：

Different metals differ in their conductivity.

不同的金属具有不同的导电性。

句中，conductivity 的所属关系用物主代词 their 来明确。

汉语的代词一方面种类少，主要是人称代词和物主代词两类；另一方面使用频率低，一篇一二百字的短文，难得见一两个代词，甚至一个代词不用的情况也并非罕见。