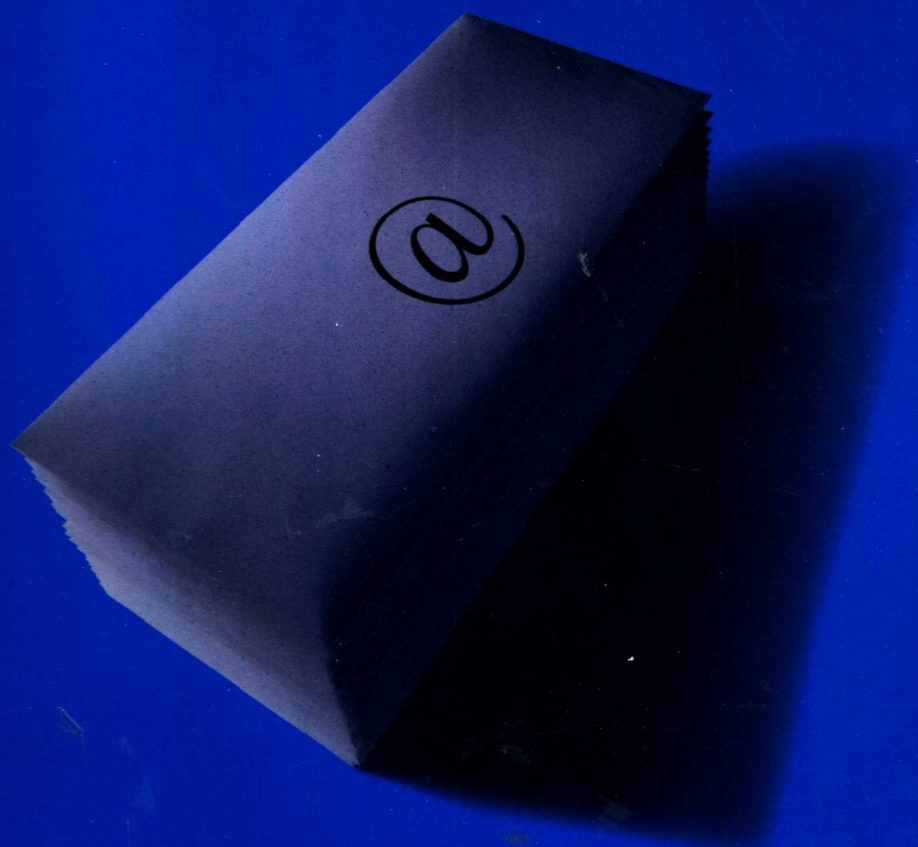
高职高专教材

电子与通信技术专业英语

刘小芹　刘骋　主编
谢德荣　主审



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内 容 提 要

本书以在介绍电子与通信英语的专业词汇及其用法的基础上，全面、系统地介绍了电子与通信技术的基础知识、最新理论及实践成果，旨在使学生通过较短时间的学习，提高阅读电子与通信技术英语资料的能力。全书共分五个单元、29 课，参考学时数为 60 学时，每一单元后还附有阅读材料，题材广泛，内容丰富。

本书可作为高职高专电子与通信类专业英语的教学用书，也可作为相关工程技术人员的参考用书。

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电子与通信技术专业英语

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前　　言

随着新技术革命的发展及经济全球化的到来，社会对专业人才的外语能力的要求越来越高，理工科的学生除了具有一定的听说能力以外，还应掌握一定的本专业的基本词汇，具有基本的阅读本专业外文资料和进行专业交流的能力。为了更好地培养学生的专业外语能力，我们编写了这本《电子与通信技术专业英语》。

本书共分五个单元、29 课，参考学时数为 60 学时。每课包括课文、词汇表、注解和练习，学习重点放在阅读理解、词汇积累和书面翻译上。为巩固和拓宽学习内容，每单元都附有阅读材料，可让学生课外阅读和翻译，也可作为测试题目。本书所选材料均来自国内外工程资料和教材，紧密结合专业知识，并按专业内容循序渐进，目的是让学生在较短时间内积累一定数量的专业词汇 ，熟悉专业文章的表达，培养阅读电子和通信技术英文资料的能力。为了便于学生自学，所有课文都附有译文。本书可作为高职高专电子与通信类专业英语的教学用书，也是从事通信、计算机和电子技术等方面技术工作的工程技术人员的自学或参考用书。

本书由刘小芹、刘骋主编，由谢德荣主审。由于编者水平有限，加上时间仓促，书中定有不少疏漏和错误之处，敬请读者批评指正。

编著者

Contents

Unit Ⅰ Basic Knowledge of Electronics

Lesson 1 Current, Voltage and Resistance

The flow of electrons through a conductor is called a current. Current flow is represented by the letter symbol *I*. The basic unit in which current is measured is the ampere(amp). One ampere of current is defined as the movement of one coulomb(6.28×10^{18} electrons)past any point of a conductor during one second of time.

When it is desirable to express a magnitude of current smaller than the ampere, the milliampere(mA)and the microampere(μA)units are used. One milliampere is equivalent to one-thousandth (0.001) of an ampere, and one microampere is equivalent to one-millionth (0.000 001)of an ampere.

The term voltage(represented by the letter symbol *U*)is commonly used to indicate both a difference in potential and an electromotive force. The unit in which voltage is measured is the volt. One volt is defined as that magnitude of electromotive force required cause a current of one ampere to pass through a conductor having a resistance of one ohm.

A magnitude of voltage less than one volt is expressed in terms of millivolts(mV)or microvolts(μV). Larger magnitudes of voltage are expressed in kilovolts(kV). One kilovolt equals one thousand volts.

The opposition to current is called electrical resistance and is represented by the letter symbol *R*. The unit of resistance is the ohm, a term that is often expressed by using Ω. One ohm is defined as that amount of resistance that will limit the current in a conductor is one ampere when the voltage applied to the conductor is one volt. Larger amounts of resistance are commonly expressed in kiloohm(kΩ)and in megohm(MΩ).

The relationship between volts, amperes, and ohms can be represented by " Ohm's Law". Ohm's Law states that the ratio of the voltage between the ends of a" wire and the current flowing in it is equal to the resistance of the wire. Now, we can say that when a given voltage is applied across the ends of the wire, an electric current always flows along it, and the value of

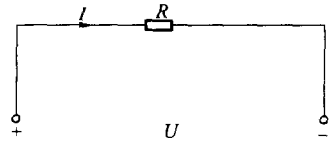

Fig. 1-1 Current, Voltage and Resistance

this current depends on the resistance of wire(as shown in Fig. 1-1).

Words and Expressions

conductor *n.*	导体，导线
symbol *n.*	符号，标志，象征
ampere *n.*	安培
coulomb *n.*	库仑
magnitude *n.*	大小，数量，巨大，广大
equivalent *a.*	相等的，相同的，等量的
volt *n.*	伏特

Notes

1. The flow of electrons through a conductor is called a current：通过导体的电子流称为电流。
2. The basic unit in which current is measured is the ampere(amp)：量度电流的基本单位是安培。句中 in which current is measured 是定语从句，修饰 unit。
3. to be defined as：给……下定义为，后可接名词或宾语从句，如课文中第四段。
4. When it is desirable to express a magnitude of current smaller than the ampere...：it 是形式主语，不定式 to express a magnitude of current smaller than the amper 充当真正的主语。
5. ... required cause a current of one ampere to pass through a conductor having a resistance of one ohm...：过去分词 required 充当后置定语，修饰 electromotive force；having a resistance of one ohm 是现在分词短语，充当后置定语，修饰 conductor。
6. ... term that is often expressed by using Ω：此为 ohm 的同位语，其中 that is often expressed by using Ω 是定语从句，修饰 term。
7. ... that will limit the current in a conductor is one ampere when the voltage applied to the conductor is one volt：定语从句，修饰 amount of resistance，其中 when the voltage applied to the conductor is one volt 是时间状语从句。

Exercises

Ⅰ. Write T(True)or F(False)beside the following statements about the text.

1. Current flow is represented by the letter symbol *I*.
2. One milliampere is equivalent to one-thousandth(0.001)of an ampere, and one microampere is equivalent to one-billionth(0.000 000 001)of an ampere.
3. The term voltage is commonly used to indicate a difference in potential but electromotive force is not.
4. One kilovolt equals one thousand volts.

5. The opposition to current is called electrical resistance.
6. Larger amounts of resistance are commonly expressed in kiloohm(kΩ) and in megohm (MΩ).
7. The flow of electrons through a conductor is called a resistance.
8. One volt is defined as that magnitude of electromotive force required cause a current of one ampere to pass through a conductor having a resistance of one ohm.

Ⅱ. Match the following terms to appropriate definition or expression.

1. current	a. electromotive force
2. amp	b. The relationship between volts, amperes, and ohms
3. voltage	c. The flow of electrons
4. ohm	d. the unit of resistance
5. Ohm's Law	e. The unit in which current is measured

Ⅲ. Fill in the missing words according to the text.

1. One ampere of current is defined as the movement of _____ coulomb (6.28×10^{18} electrons) past any point of a conductor during _____ second of time.
2. One milliampere is equivalent to _____ (0.001) of an ampere, and one microampere is equivalent to _____ (0.000 001) of an ampere.
3. One volt is defined as that magnitude of electromotive force required cause a current of one _____ to pass through a conductor having a _____ of one ohm.
4. One ohm is defined as that amount of _____ that will limit the current in a conductor is one ampere when the _____ applied to the conductor is one volt.

Ⅳ. Translate the following into Chinese.

Potential

The unit for potential difference, or electromotive force, is the volt. The abbreviation, or symbol, for this unit is V. Voltage is expressed in volts. Recall that one volt equals the amount of electromotive force(emf) that moves a current of one ampere through a resistance of one ohm.

Current

The unit of measure for current flow is the ampere. The abbreviation, or symbol, for this basic unit of measure is A. Remember that one ampere equals an electron flow of one coulomb per second past a given point.

Resistance

Resistance is another electrical parameter that two letter: "R" represents the general term resistance and the Greek letter omega(Ω) represents the unit of resistance, the ohm. Remember that one ohm equals the resistance that limits the current to one ampere with one

volt applied.

Conductance

Another electrical parameter is conductance. Conductance is the opposite of resistance. The unit of conductance is the siemens(S) named after the scientist Ernst Siemens. The abbreviation for the general term conductance is G.

Ⅴ. Translate the following into English.

1. 电压的单位是伏特，用符号 V 表示。
2. 电流的单位是安培，用符号 A 表示。
3. 1 伏特的电压施加在导体上产生了 1 安培的电流，此时电阻为 1 欧姆。
4. 欧姆定律表示了电流、电压、电阻之间的关系。

Lesson 2 Capacitance and Inductance

Capacitance

Electrical energy can be stored in an electric field. The device to be capable of doing this is called a capacitor or a condenser.

A simple condenser consists of two metallic plates separated by a dielectric. If a condenser is connected to a battery, the electrons will flow out of the negative terminal of the battery and accumulate on the condenser plate connected to that side. At the same time, the electrons will leave the plate connected to the positive terminal and flow into the battery to make the potential difference just the same as that of the battery(as shown in Fig. 1-2(a)). Thus the condenser is said to be charged.

The capacitance is directly proportional to the dielectric constant of the material and to the area of the plates and inversely to the distance of the plates. It is measured in farads. When a change of one volt per second across it causes the current of one ampere to flow, the condenser is said to have the capacitance of one farad. However, farad is too large a unit to be used in radio calculation, so microfarad (one millionth of a farad) and the picofarad (10^{-12} farads) are generally used.

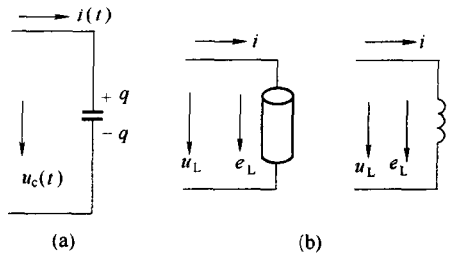

Fig. 1-2 Capacitance and Inductance

The amount of the stored energy of a charged condenser is proportional to the applied voltage and its capacitance. The capacitance of a condenser is determined by three important factors, namely, the area of the plate surface, the space between them and dielectric material. The larger the plate area, the smaller the space between them, the greater the capacitance.

One of the condensers to be used in radio receiver is a variable condenser, whose capacitance can be varied by turning the plates. It is used in the receiver for tuning and varying capacitance in the circuit so as to pick up the desired signals of different wavelengths.

Inductance

It is well known that inductors are one of the main building blocks in electronic circuits. An inductor is simply a coil of wire with or without a magnetic core(as shown in Fig. 1-2 (b)).

All coils have inductance. Inductance is the property of opposing any change of current flowing through a coil. If a coil offers a large opposition to the current flowing through it at a certain frequency, it is said to have large inductance. A small inductance would provide less

opposition at the same frequency, and resistance offers an opposition to all current flow.

When an emf is applied to a coil, there is an induced emf in it. The polarity of the induced emf is always such as to oppose any change in the current in the circuit. This means that the property of inductance oppose an increase in current just as much as it opposes a decrease in current.

A coil of many turns will have more inductance than one of few turns. Also if a coil is placed on an iron core its inductance will be greater than it was without the magnetic core. The unit of inductance is the henry. A coil has an inductance of one henry if an induced emf of one volt is induced in the coil when the current through it changes at the rate of one ampere per second. Values of inductance used in radio equipment vary over a wide range.

Words and Expressions

capacitance *n.*	电容
turn *v.*	转动
device *n.*	器件
variable *a.*	可变的
capacitor *n.*	电容器
tune *v.* & *n.*	调谐
condenser *n.*	电容器
metallic *a.*	金属的
desire *v.*	希望，想
palate *n.*	板
proportional *a.*	成比例的
separate *v.*	分隔
dielectric *n.*	介质
signal *n.*	信号
battery *n.*	电池
wavelength *n.*	波长
accumulate *v.*	聚积
charge *v.*	充电
discharge *v.*	放电
external *a.*	外部的
wire *n.*	导线
restore *v.*	恢复
neutrality *n.*	中性
farad *n.*	法拉
pick up	建立，接收
to be proportional to	与..... 成比例

Notes

1. The device capable of doing this is called a capacitor or a condenser: capable of doing this 是形容词短语，充当后置定语，修饰 device, 如：a place different from the earth.
2. A simple condenser consists of two metallic plates separated by a dielectric：一个电容器由两个被介质隔开的金属平板构成。to consists of 意思是“由……组成”；separated by a dielectric 是过去分词短语，充当后置定语，修饰 plates。
3. ... and accumulate on the condenser plate connected to that side：connected to that side 是过去分词短语，充当后置定语，修饰 plate。
4. At the same time, ... and flow into the battery to make the potential difference just the same as that of the battery：同时，电子从与电池正极相连的金属平板流进电池正极，由此产生电位差，其值等于电池的电压值。at the same time 的意思是“同时”，相当于 meanwhile；不定式短语 to make ... that of the battery 是结果状语，其中 that 指 the difference。
5. The capacitance is directly proportional to the dielectric constant of the material and to the area of the plates and inversely to the distance the plates：电容器的电容量与介质的介电常数及平板的面积成正比，与平板间的距离成反比。to directly proportional to 意思是“与……成正比”；to inversely proportional to 意思是“与……成反比”。
6. ... namely, the area of the plate surface, the space between them and dielectric material：namely 相当于 that is to say，引出三个名词短语，充当 factors 的同位语。
7. One of the condensers to be used in radio receiver is a variable condenser, whose capacitance can be varied by turning the plates：不定式短语 to be used in radio receiver 充当后置定语，修饰 condensers；whose capacitance can be varied by turning the plates 是非限制性定语从句，修饰 condenser。
8. ... for tuning and varying capacitance in the circuit so as to pick up the desired signals of different wavelengths：for + 动名词短语，充当目的状语；so as + 不定式短语 to pick up the desired signals of different wavelengths，充当目的状语。
9. It is well known that inductors are one of the main building blocks in electronics circuits：众所周知，电感器是电路的主要部件之一。It is well known that... 是一个重要句型，It 是形式主语，that 引导主语从句。
10. ... to the current flowing through it at a certain frequency, it is said to have large inductance：现在分词短语 flowing through it at a certain frequency 充当后置定语，修饰 current。
11. When an emf is applied to a coil, there is an induced emf in it：当把电动势加到线圈上时，线圈中就会产生感应电动势。an induced emf 中 induced 充当定语，修饰 emf；emf 是electromotive force的缩略。
12. This means that the property of inductance oppose an increase in current just as much as it opposes a decrease in current：this 指前句，即"The polarity of ... in the circuit"；as

... as 引出比较状语从句。

13. Values of inductance used in radio equipment vary over a wide range: 用于无线电设备的电感值在很大范围内变化。used in radio equipment 是过去分词短语，做后置定语，修饰 values of inductance。

Exercises

Ⅰ. Write T(True) or F(False) beside the following statements about the text.

1. A simple condenser consists of two metallic plates separated by a conductor.
2. The capacitance is directly proportional to the dielectric constant of the material.
3. The amount of the stored energy of a charged condenser is proportional to the applied voltage only.
4. The larger the plates areas, the smaller the space between them , the greater the capacitance.
5. If a coil offers a small opposition to the current flowing through it at a certain frequency, it is said to have large inductance.
6. Property of inductance oppose an increase in current just as much as it opposes a decrease in current.
7. A coil of many turns will have less inductance than one of few turns.
8. A coil has an inductance of one henry if an induced emf of one volt is induced in the coil when the current through it changes at the rate of one ampere per second.

Ⅱ. Match the following terms to appropriate definition or expression.

1. capacitor or a condenser	a. an electromotive force
2. microfarad	b. the unit of inductance
3. picofarad	c. as an electric field to store electrical energy
4. inductor	d. coil of wire with or without a magnetic core
5. Henry	e. one millionth of a farad
6. emf	f. 10^{-12} farads

Ⅲ. Fill in the missing words according to the text.

1. When a change of one _____ per second across it causes the current of one ampere to flow, the condenser is said to have the capacitance of one _____.
2. The capacitance of a _____ is determined by three important factors, namely, the area of the _____ surface, the space between them and dielectric material.
3. A small inductance would provide less _____ at the same frequency, and resistance offers an opposition to all current flow.
4. Also if a coil is placed on an _____ its inductance will be greater than it was without

the _____ core.

Ⅳ. Translate the following into Chinese.

To discharge the condenser he external circuit of these two plates is completed by joining terminals together with a wire. The electrons start moving from one plate to the other through the wire to restore electrical neutrality.

The amount of inductance, L(measured in henrys), relates to the physical properties of the coil, including the length, cross-sectional area, number of turns, and type of core. Also, there is a relationship between the amounts of inductance and induced emf that develops for any given rate of current change through the coil.

Ⅴ. Translate the following into English.

1. 简单的电容器是由两块金属板夹介质构成。
2. 被放电的电容器所储存的能量正比于外加电压和它的容量。
3. 电感的单位是亨利。
4. 当把电动势加到线圈上时，线圈中就会产生感应电动势。

Lesson 3 The Transistor and Its Basic Circuit

Transistors are the most important device in electronics today. Not only are they made as discrete(separate)components but also integrated circuits(ICs)may contain several thousands on a tiny slice of silicon.

Transistors are three-terminal devices used as amplifiers and as switches. There are two basic types. They are:

(Ⅰ) the junction transistor(usually called the transistor); its operation depends on the flow of both majority and minority carriers and it has two P-N junctions.

(Ⅱ) the field effect transistor(called the FET)in which current is due to majority carriers only(either electrons or holes)and there is just one P-N junction.

A transistor consists of three layers of semiconductor material: a thin layer of one type with the other type on each side. There are two possible arrangements: N-type in the middle with P-type on each side(PNP)and P-type in the middle with N-type on each side(NPN). The center is called base, one outside layer is called the emitter, and the other is known as the collector(as shown in Fig. 1-3).

A transistor is an electronically device that regulates the current flowing through it. Current from a power source enters the emitter, passes through the very thin base region, and leaves via the collector. Current flow is always in this direction. This current can be made to vary in amplitude by varying the current flowing in the base circuit. It takes only a small change of base current to control a relatively large collector current. It is this ability that enables the transistor to amplify.

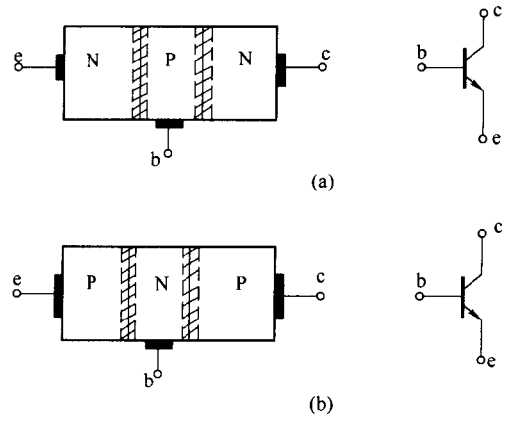

Fig. 1-3 P-N Junction and Transistor

There are three basic ways of connecting transistors in a circuit(as shown in Fig. 1-4): common-base, common-emitter, and common-collector. In the common-base connection, the signal is introduced into the emitter-base circuit and extracted from the collector-base circuit. Because the input or emitter-base circuit has a low impedance in the order of 0.5 to 50 ohms, and the output or collector base circuit has a high impedance in the order of 1000 ohms to one megohm, the voltage or power gain in this type of configuration may be in the order of 1500.

In the common-emitter connection, the signal is introduced into the base-emitter circuit and extracted from the collector-emitter circuit. This configuration has more moderate input

and output impedance than the common-base circuit. The input(base-emitter)impedance is in the range of 20 to 5 000 ohms, and output(collector-emitter)impedance is about 50 to 50 000 ohms. Power gain in the order of 10 000(or about 40dB)can be realized with this circuit because it provides both current gain and voltage gain.

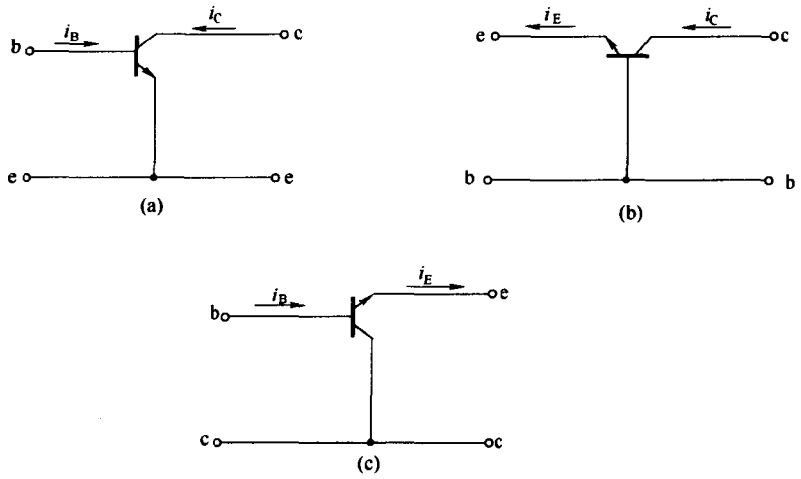

Fig. 1-4 Three Basic Ways of Connecting Transistors in A Circuit

The third type of connection is the common-collector circuit. In this configuration, the signal is introduced into the base-collector circuit and extracted from the emitter-collector circuit. Because the input impedance of the transistor is high and the output impedance low in this connection, the voltage gain is less than one and the power gain is usually lower than that obtained in a common-base or a common-emitter circuit.

Words and Expressions

semiconductor *n.*	半导体
base *n.*	基极
emitter *n.*	发射极
collector *n.*	集电极
forward *ad.*	正向
bias *v.* & *n.*	偏置
reverse *v.* & *n.*	反向
extract *v.*	输出
impedance *n.*	阻抗
gain *n.*	增益
configuration *n.*	结构
moderate *a.*	适度的
provide *v.*	提供