普通高等教育"十二五"规划教材

测控技术与仪器专业英语

Special English for Measurement and Control

张凤登 ◎ 编

机械工业出版社
CHINA MACHINE PRESS

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本书是针对高等学校测控技术与仪器专业科技英语阅读课程的需要而编写的教材，内容涉及电气电路、半导体、传感器、测量技术、数字电子系统、计算机、信号处理、智能仪表、控制系统和实时系统等方面，涵盖了测控技术与仪器专业的主要技术基础，并力求反映最新技术进步。全书共分17个单元，每个单元包括4个部分，分别为Text、Reading and Translation、Further Reading和General Knowledge，有助于读者学习和掌握专业基础知识和专业词汇，阅读和理解专业题材的英语文章，掌握专业英语翻译和写作方面的必备知识。

全书内容丰富，题材新颖，英语和专业知识有机结合，适合不同层次的读者。本书既可作为高等学校测控技术与仪器专业英语教材，也适用于自动化、电子信息、电气工程、计算机类专业，亦可作为工程技术人员的培训教材或参考书。

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前　　言

大学英语教学大纲规定，大学本科的英语教学分为基础阶段和专业阅读阶段。从实践中我们体会到，基础阶段学生所接触的英文材料在文体和词汇方面与专业阅读阶段存在较大差别。为了增强测控技术类专业本科生阅读英文专业书刊、文选等科技资料的能力，提高学生的语言应用水平，更好地以英语为工具，获取专业所需要的信息，我们在总结过去十多年教材编写和课堂教学经验的基础上，参考教学大纲，并以继承和创新为原则，编写了《测控技术与仪器专业英语》这本教材。

本书力图通过大量阅读专业方面的材料，使学生不仅可以学到英语，而且还能学到一定的专业知识，熟悉和了解专业题材文章的特色并掌握一定量的专业词汇，从而为他们未来的专业资料阅读奠定良好基础。《测控技术与仪器专业英语》的内容极其繁多，在编写过程中，作者根据该专业的技术进步路线，将这一庞大的主题细化，使之更易于阅读和理解。英文文章的选材强调与专业相关的基本原理和重要概念，同时也探讨了一些该专业的高新技术。

全书由17个单元组成，各单元均按专业知识划分，内容涉及电气电路、半导体、传感器、测量技术、数字电子系统、计算机、信号处理、智能仪表、控制系统和实时系统等方面，在编排上既考虑了专业知识的连贯性，又兼顾了英语语言深度上的循序渐进。每个单元包括4个部分，分别为Text、Reading and Translation、Further Reading和General Knowledge。Text部分有一篇阅读文章，其后配有练习，旨在提高学生对科技题材文章的阅读和理解能力，以及训练学生的语言运用能力；Reading and Translation部分也有一篇文章，是为学生的英译汉练习而安排的，旨在让学生不仅要注意单词、词组和单句的译法，还要注意上下文对译文的影响；Further Reading部分是一篇难度稍大的段落或短文，目的在于延伸与该单元相关的知识，进一步扩大学生的专业词汇量；General Knowledge部分介绍一些学生必备的专业英语知识，内容包括符号与公式的读法、专业英文期刊、科技英语翻译、科技论文写作和应用文写作等。

本书一般在第五学期使用，约需32~36学时。

本书的编写充分利用了自编讲义《测量与控制专业英语》和我校颜国伟老师主编的《电气和电子工程》一书，同时得到了机械工业出版社和我的同事们的大力支持。我校的黄海峰、王志坚、王华伟、陈兴隆、贺波、邱展辉、曹栩秋、常国鹏、胡忠义、李思、刘雅旎和童长胜等在本书的组织结构设置、英文材料选定方面提出了许多宝贵意见，并仔细校对了部分或全部书稿。在此谨向他们以及本书中引用的参考文献的作者致以衷心的感谢。

由于编者水平有限，书中错误和不足之处在所难免，敬请读者批评指正。

编　者

目　　录

UNIT 1 Electrical and Electronic Engineering

1.1 Text

Introduction to Electrical and Electronic Engineering

The electrical and electronic industry has continued to mature to the point where almost every person, household, or industry in the world has been influenced by its accomplishments. Most obvious is the widespread acceptance of the computer at every level of our lives. Its speed, size, and cost make it readily available and effective in business and personal ventures. Electronics has provided radio, television, VCRs, and so on, as entertainment products in almost every household. Integrated circuits are now a part of most modern electronic systems and continue to provide smaller, more sophisticated end products. The engineer of the early 1950s would be in awe of the amount of circuitry that can be contained in a single integrated circuit, and today's engineer will probably be astounded by the technological progress that will take place by the year 2020.

Electronic systems will undoubtedly become a standard part of an increasing number of products since they offer a number of benefits that are cost-effective. Automotive functions previously performed by mechanical components are being replaced by electronic equivalent units, phonograph records using mechanical pickup transducers are being replaced by electronic compact disc units, mechanical typewriters are being replaced by electronic units and computer word-processing units, to name just a few examples of the transition to more IC electronic technology①.

The growth of the electronic industry is due partly to the low-cost, very small size, relatively complete electronic systems referred to as very-large-scale integrated (VLSI) circuits. It is impressive to consider that within the typical small calculator there is essentially one small IC package occupying less than one-fifth of the inside volume, and within this VLSI package is an even smaller chip on which the total circuitry exists. A VLSI component contains hundreds of thousands of individual electronic components arranged in the various functional parts of the unit. These include storage stages, counter circuitry, memory circuits, arithmetic circuits, and so on.

The single-chip VLSI is the heart of the electronic watch, replacing the long established analog movement watches. As the electronic manufacturing technology has matured, the functions in a single hand-worn unit have increased. In addition to keeping count of the time, the additional circuit complexity has made possible an alarm function, stopwatch functions, calculator operation, storage of telephone numbers, and storage of messages, to name the more prevalent②. Electronic devices are now made using CMOS circuitry which uses very little power, permitting units such as watch circuits to operate for years on a single small battery.

Electronic products have been developed for engineering applications as well as for special commercial products. The availability of small, low-cost electronic components now makes it practical to include electronic systems in many new areas of application, including measuring instruments, and in the mechanical, chemical, civil, and biomedical engineering fields, among others. In each of these areas electronic circuitry—both linear and digital ICs—has been added to provide more automatic operation, digital display, and more central control, and to add additional features not presently available. For example, digital thermometers now provide faster, more easily visible display in a small, compact, portable instrument. Similarly, instrumentation, oscilloscopes, and measurement equipment now include digital display and control circuitry to provide automatic scale selection and digital read-out.

Probably the greatest advances in the VLSI area have been made in microprocessors and in digital memory units. The complexity of microprocessor circuits has increased from handling 4 bits at a time to 8bits, 16 bits, and now 32 bits at a time. Memory capacity has also increased, so that the same-size IC that once held 16 kilobits now holds at least 1 megabit. This tremendous increase in packaging density has greatly extended the types of problems that can be handled by these small devices. For example, the increased storage capacity has enabled small units to provide voice output.

New Words

accomplishment	[əˈkɔmpliʃmənt]	*n.* 成果；成就
readily	[ˈredili]	*ad.* 容易地；乐意地
integrate	[ˈintigreit]	*v. a.* 使……结合，综合；完全的
circuit	[ˈsəːkit]	*n.* 电路
sophisticated	[səˈfistikeitid]	*a.* 复杂的；尖端的
circuitry	[ˈsəːkitri]	*n.* 电路（总称）
astound	[əˈstaund]	*v.* 使……大吃一惊
component	[kəmˈpəunənt]	*n.* 元件；部件
equivalent	[iˈkwivələnt]	*n.* 相等的；相同的
phonograph	[ˈfəunəgrɑːf]	*n.* 唱机
pickup	[ˈpikʌp]	*n.* 拾音；拾波
transducer	[trænzˈdjuːsə]	*n.* 传感器；换能器
compact	[kəmˈpækt]	*a.* 紧凑的；密集的
disc	[disk]	*n.* 光碟
transition	[trænˈsiʒən]	*n.* 过渡
IC		*abbr.* 集成电路（integrated circuit）
VLSI		*abbr.* 超大规模集成电路（very large scale integrated circuit）
package	[ˈpækidʒ]	*n.* 集成块
chip	[tʃip]	*n.* 芯片
analog	[ˈænəlɔg]	*n.* 模拟

stopwatch	[ˈstɔpwɔtʃ]	*n.* 秒表
CMOS		*abbr.* 互补金属氧化物半导体 (complementary metal oxide semiconductor)
prevalent	[ˈprevələnt]	*a.* 普遍的；流行的
biomedical	[baiəuˈmedikəl]	*a.* 生物医学的
linear	[ˈliniə]	*a.* 线性的
digital	[ˈdidʒitəl]	*a.* 数字的
instrumentation	[ˌinstrumenˈteiʃən]	*n.* 仪表检测；仪表测量
oscilloscope	[ɔˈsiləskəup]	*n.* 示波器
microprocessor	[ˌmaikrəuˈprəusesə]	*n.* 微处理器
bit	[bit]	*n.* 位
kilobit	[ˈkiləubit]	*n.* 千位
megabit	[ˈmegəbit]	*n.* 兆位，百万位

Notes

① to name just... 这仅仅是……。

② ..., to name the more prevalent. ……这些仅是较流行的功能。

Exercises

1. Choose the best answer for each of the following.

(1) Which of the following is the reason that makes the computer possible to be used in personal affairs and business?

A. The computer works at a fast speed. B. The computer has become small.

C. The computer costs little money. D. All of the above.

(2) Future accomplishments in the electrical and electronic industry may take aback ______.

A. today's products B. today's engineers

C. early engineers D. sophisticated electronic systems

(3) From the second paragraph, we can see that the electronic units will undoubtedly ________.

A. increase mechanical products

B. become a standard in making products

C. turn out to be a standard component of more and more products

D. be substituted by mechanical units

(4) Different functional components of a small calculator such as storage stage, counter circuitry, memory circuits and so on may exist ________.

A. on a tiny chip B. on different chips

C. in the separate packages D. in the total circuitry

(5) The verbal phrase "referred to as" in the first sentence of the third paragraph can be replaced by ________.

A. preferred
B. labeled
C. reflected
D. refreshed

(6) Besides keeping count of time, the other functions of a watch consist in ________.

A. a small battery
B. its new mechanical renovation
C. its additional complicated circuits
D. advanced mechanical devices

(7) One of the areas has not been mentioned in the passage to use electronic systems. It is ________.

A. the mechanical field
B. the biomedical field
C. the educational field
D. the chemical field

(8) The great increase in packaging density has enabled the small devices to ________.

A. handle 8 bits
B. hold 16 kilobits
C. solve finite problems
D. possess voice output

2. Fill in the blanks with the suitable words below in the correct form.

□electrical □ electrify □ electron □ electronic
□electronics □ electrician □ electricity

(1) More and more electric devices use ________ components instead of mechanical ones.

(2) There is something wrong with the panel; an ________ should be called on to repair it.

(3) The applications of electricity have grown to the point where most of us lead "________ lives," surrounded by a variety of devices that use ________ energy.

(4) ________ is the branch of science that deals with the behavior of electrons.

(5) When ________ is applied to a capacitor, it causes an energy change to take place.

(6) The ________ accelerators are used frequently in the laboratories.

3. Select the best choices to complete the article.

Although electricity has transformed the modern world, what we know about its behavior is based on a theory. A theory is simply a ___(1)___ (declaration, description, understanding) of how and why things work as they do. Theories are frequently developed to ___(2)___ (explain, say, depict) the operation of physical behaviors in our world. If a theory can be proven to be correct in all cases, we call it a ___(3)___ (theory, theme, law) . The theory of electricity has not yet been proven or disproven, ___(4)___ (so, but, otherwise) it remains a theory.

The electron theory of current flow states that ___(5)___ (battery, cell, electricity) is a flow of electrons. But what are electrons? Electrons are small, high-speed ___(6)___ (nuclei, elements, particles) associated with an atom. An ___(7)___ (atom, element, electron) is the smallest particles of an element. An element is a pure material that contains atoms of a ___(8)___ (like, alike, likely) size and character. For example, gold is an element. All atoms of ___(9)___ (iron, copper, gold) are exactly alike in all ___(10)___ (fields, regions, respects) .

The electrons ___(11)___ (go, move, orbit) the nucleus of an atom at a high rate of speed. An electron is said to be ___(12)___ (negatively, positively, neutrally) charged.

1.2 Reading and Translation

Read the following passage and translate the italicized parts into Chinese.

Early Development for Electrical Engineering

As early as the latter part of the 16th century, experimenters were exploring the behavior of static electricity. W. Gilbert experimented with electric charges and discharges. In 1750 Benjamin Franklin proved that lightning was electrical in nature. Neither investigator discovered anything that was significant from the standpoint of the applications of electricity. *Discovery of the presence of magnetism in certain rocks preceded the earliest knowledge of electricity.* Such knowledge was common about 600 B. C. Applications of electrical knowledge were completely absent in this era.

In 1800 A. Volta discovered the principle of the electric battery. The voltaic cell was one of the most important discoveries in the history of the electrical art, because it provided a continuous source of appreciable amounts of electric power at reasonably low voltage. It was an essential component of the early communication systems, such as the telephone and telegraph.

The first United States patent on the electrical telegraph was obtained by J. Groat in 1800. The invention of a practical electromagnet was announced by Joseph Henry in 1827. These inventions by Groat and Henry opened the way for a still more significant invention, the electromagnetic telegraph. *The principle of this forerunner of the communication industry was conceived in* 1831, *proven practical in* 1837, *and patented in* 1840 *by Samuel. F. B. Morse.*

Few developments have had greater impact on American life than Morse's invention. His idea paved the way for the first system of electrical communication, the telegraph. This in turn led to the telephone and later to the wireless telegraph.

The discovery of electromagnetic induction by Michael Faraday in 1831 established many principles upon which modern machines function. Motors, generators, transformers, and many other electrical devices found in heavy electrical industry were made possible by the discoveries of Faraday. *The contributions of Faraday in the electrical power industry are comparable to those of Morse in the field communications.*

One of the first important developments based on the disclosures of Faraday was the electric dynamo. English patent no. 1858 describes the principle of operation. In the following years many types of DC generators were developed and used commercially. The Gramme-ring armature was one of the first used in conjunction with a commutator. This machine was somewhat inefficient, but it provided a source of relatively high voltage at a reasonable large power capacity (up to 100kW).

With the development of the high-resistance carbon filament lamp by Thomas Edison in 1880, *the DC generator became one of the essential components of the constant-potential lighting system.* Commercial lighting and residential lighting became practical and the electric light and power industry was born. One of the most common uses for direct current during this period was for street lighting.

The first transformer was announced in 1883. This device probably did more to revolutionize the systems of power transmission than any other. The advantages of high-voltage low-current systems over the low-voltage high-current systems of power transmission were well known. Following the discovery of the transformer, power could be generated at low voltages, transformed to higher voltages for transmission over great distances (several hundred miles), and then reduced by transformers to lower values for utilization.

In 1880 N. Tesla was granted a patent on the polyphase AC induction motor, which soon became the most commonly used motor for supplying large amounts of power; in its improved state, it is most extensively used today.

In 1876 Alexander, Graham Bell invented the telephone. This device was soon put into use and, as a result, another huge industry was established.

Throughout this period of development, another outstanding contributor was Thomas A. Edison. His work included research, invention, development, and production. *His activities extended into chemistry, electrical dynamos, systems of transmission, sound recording and reproduction, and electrical lamps. Perhaps one of his most important discoveries was one that he did not pursue sufficiently to realize its vast importance, a discovery known in later years as the Edison effect.*

Lee De Forest introduced the use of the third element (grid) in the vacuum tube in 1906. This development opened an entirely new field of engineering. It made possible new systems of communication and methods of control and indicated the possibility of the multielement tube. It provided the basis for future developments in electronics.

With production methodology being well established, there was rapid expansion in research engineering in the first half of the 20th century. Industrial research laboratories expanded in size and in number. College faculties became increasingly aware of the importance of research to education. To administer necessary training in research, extensive research laboratories were constructed by American universities. *Academic appointments have been made of many faculty members who are trained in the systematic pursuit of scientific and engineering knowledge. Today research is an essential ingredient in the education of the engineering student—the agent by which the student develops originality, inventive genius, and an understanding of the world.*

Research today is a big business, no longer carried out by isolated individuals working over long periods. It is conducted by highly organized groups of investigators who have been selected because of their competence in certain areas of investigation. *The lapse of 30 years between invention and production which seemed to prevail in the 19th century has been shortened to several years and sometimes to several months, a saving in time which can be attributed largely to better systems of communication between scientists and engineers in the engineering profession.*

Since 1945 great advances have been made as the result of the invention of the transistor. This solid-state device has made possible the miniaturization of many components in computers, integrated circuits, and calculators. During this same period, research in electron optics has preceded the development of lasers and holography.

The rate of growth of research in electrical engineering was enhanced in the 1940s as a result of support of Federal agencies. Many ideas associated with the military effort of that period are now being used commercially and for research purposes. Microwaves have become part of modern communication systems. The development of semiconductors has made possible more rugged, smaller, and cheaper systems. Research in miniaturization has greatly increased the speed of modern computers. The laser has provided communication systems operative over millions of miles. *Integrated circuits have reduced size and weights and made practical interplanetary and satellite communications. Planetary radar astronomy and radio astronomy are also the result of adaptations to engineering systems of electrical components developed through research.*

New Words

patent	[ˈpeitənt]	*n.* 专利
armature	[ˈɑːməˌtjuə]	*n.* 电枢，（电机）转子
commutator	[ˈkɔmjuteitə]	*n.* 换向器
filament	[ˈfiləmənt]	*n.* 丝；灯丝
grid	[grid]	*n.* 栅极
laser	[ˈleizə]	*n.* 激光；激光器
holography	[hɔˈlɔgrəfi]	*n.* 全息学，全息照相（术），综合衍射学
administer	[ədˈministə]	*v.* 实施
appointment	[əˈpɔintmənt]	*n.* 职位
interplanetary	[ˌintəˈplænitəri]	*a.* 星际间的
rugged	[ˈrʌgid]	*a.* 坚固的

1.3 Further Reading

Electrical and Electronic Engineering in the Future

So much of the development of science and technology depends on the variables of economic, political, and social developments that precise predictions about future trends in the field of electrical and electronic engineering cannot be made. But it is possible to discern certain technological trends which can reasonably be expected to occur.

A major scientific advance such as the development of a comprehensive theory and knowledge of elementary particles, the basic components of all matter and energy, could profoundly change the way we live tomorrow. A theory based on knowledge of such strange objects as pulsars, stars that emit radio waves in uniform pulses, and quasars, strong radio sources and unexplained sources of enormous energy, could alter life in ways we cannot yet forecast.

Electrical and electronic scientists and engineers are engaged in examining and developing these areas. They are not restricted in their exploration to our present knowledge of space or time. With an instrument known as an electron accelerator, they probe the mysteries of the atomic nucleus, and with the radio telescope they study signals from remote regions of outer space. With computers they can store information indefinitely and with electronic circuits they can get information in a thousandbillionth of a second.

A major success such as the harnessing of thermonuclear energy produced through nuclear fusion would radically affect the development of all branches of engineering. The world would move from a state of energy scarcity to an era of inexhaustible energy resources. Given the proper economic and political circumstances, this would cause tremendous growth in science and technology.

However, if this major breakthrough does not occur, the enormous need for new energy resources will continue to grow. With the ever-increasing use of fossil fuels, the effort of much of the technological community is already directed toward the discovery of new sources of non-fossil fuels. Solar, geothermal (relating to the heat of the earth's interior), tidal, and wind sources of energy are gradually becoming more economically possible. A technological breakthrough in any one of these fields would provide research work for tens of thousands of electrical engineers. New and improved types of cells, batteries, generators, converters, power plants, and transmission lines would have to be designed, tested, evaluated, and built in order to properly use the new source of energy.

In any case①, the future of electrical and electronic engineering does not depend solely on the development of new scientific theories or the discovery of new energy sources. These engineers will be engaged in diverse technological pursuits such as the following.

Electrical and electronic engineers will be intimately involved in the development of the completely automated industrial factory. It will become possible, with the aid of electronic computers, to produce goods by teams of machines that transfer materials from one to another. In such a factory a product could be manufactured, tested, labeled, packaged, and shipped without being touched by human hands or directed by human intellect.

In the field of transportation, electrical engineers are currently engaged in developing the electric automobile, train, bus, and ship. They are designing new inertial guidance systems which would guide rockets and interplanetary spaceships by using devices which detect changes in speed and direction and make necessary adjustments automatically.

Fueling aircraft and spacecraft by laser beam is another possibility that will transform future travel. As light energy can be converted into other forms of energy, so could the laser beam be converted to aircraft fuel. Such a breakthrough would greatly reduce the weight of aircraft and thereby increase the probability of hypersonic travel—travel at speeds five or more times greater than the speed of sound. Planes could travel at 4 000 to 5 000 miles an hour and at altitudes of 150 000 feet.

Society will become more and more computerized, and the electronic engineer will be called upon to design and build ever-smaller computers capable of doing more varied and more complicated tasks. At some time in the future, fully automatic automobiles and homes will be built and directed by computers. Computers that "think", that learn from errors and never make the same mistake twice, that are able to repair themselves and reproduce themselves, may be the reality of tomorrow.

Cybernetics, the science of automatic controls, could eventually produce a race of robots—machines in human shapes that perform human tasks with what parallels human intelligence. Only human sensitivity, emotion, and sexuality will be missing. The necessary scientific knowledge for building these labor-replacing devices is available to engineers today: computer technology, microcircuit technology, control theory, and information theory—a mathematical analysis of the efficiency with which computers, telecommunication channels, and other information-processing systems are employed. The electronic engineer need only translate today's knowledge into tomorrow's machinery.

The exciting field of biomedical engineering offers enormous possibilities. More and more electronic instruments to extend, repair, and improve upon physical life are currently being developed. Lasers are already used to join living tissues such as detached eye retinas; their uses in surgery too intricate and delicate for the knife will become commonplace. Computers will be developed to diagnose and treat disease. Electronic engineers will devise more usable and varied organs and organ replacements. There is, theoretically, no limit to the uses of electronics in medicine.

Not only will the new developments make use of the electronic engineer; he or she will develop new electronic products for people to buy. Telephones with picture screens on which the connected parties can see each other and three-dimensional television which would completely envelope the viewer could become ordinary household items.

Research and development, or R and D—investigation and experimentation by scientists, engineers, and technicians is not confined to sciences such as physics or radio astronomy. Countless engineers will continue to design and improve upon existing vacuum tubes, switches, and electromechanical devices. Improvements will be made in antennae, arrangements of wires and rods which fan out to receive electromagnetic waves; filters, which block out selected waves or current; transducers, which convert one form of energy to another; and relays, which electrically cause switches in a circuit to open and close. These are the basic components of the electronic industry and a vital segment of the industries that maintain our economy.

These exciting possibilities indicate a bright future for electrical and electronic engineers. They will play a central role in formulating, shaping, and bringing into being the immediate and distant future.

New Words

discern	[di'sə:n]	*v.* 看到；辨出
profoundly	[prəu'faundli]	*ad.* 极度地；极大地
pulsar	['pʌlsɑ:]	*n.* 脉冲星
quasar	['kweizɑ:]	*n.* 类星体
probe	[prəub]	*v.* 探索
nucleus	['nju:kliəs]	(*pl.* nuclei) *n.* （原子）核
indefinitely	[in'definətli]	*ad.* 无限期地
harness	['hɑ:nis]	*v.* 利用
thermonuclear	[ˌθə:məu'nju:kliə]	*a.* 热核的，聚变的。~ reaction 热核反应
fusion	['fju:ʒən]	*n.* 聚变
radically	['rædikəli]	*ad.* 极大地

inexhaustible	[ˌinigˈzɔːstəbl]	*a.* 无穷无尽的
fossil	[ˈfɔsəl]	*a. n.* 矿物的；矿物
geothermal	[ˌdʒiːəuˈθəːməl]	*a.* 地热的
interior	[inˈtiəriə]	*n.* 内部
converter	[kənˈvəːtə]	*n.* 转换器，换流器
transmission	[trænzˈmiʃən]	*n.* 传输
evaluate	[iˈvæljueit]	*v.* 评价
diverse	[daiˈvəːs]	*a.* 多种多样的
inertial	[iˈnəːʃəl]	*a.* 惯性的
hypersonic	[ˌhaipəˈsɔnik]	*a.* 特超音速的
altitude	[ˈæltitjuːd]	*n.* 高度
cybernetics	[ˌsaibəˈnetiks]	*n.* 控制论
sensitivity	[ˌsensiˈtiviti]	*a. n.* 敏感性，灵敏度
microcircuit	[ˈmaikrəuˌsəːkit]	*n.* 微型电路
tissue	[ˈtiʃjuː]	*n.* 组织
retina	[ˈretinə]	*n.* 视网膜
detached	[diˈtætʃt]	*a.* 分离的
intricate	[ˈintrikət]	*a.* 复杂的
commonplace	[ˈkɔmənpleis]	*a.* 平凡的
diagnose	[ˈdaiəgnəuz]	*v.* 诊断
astronomy	[əˈstrɔnəmi]	*n.* 天文学
vacuum	[ˈvækjuəm]	*a.* 真空的
electromechanical	[iˌlektrəumiˈkænikəl]	*a.* 机电的，电机的
electromagnetic	[iˌlektrəumægˈnetik]	*a.* 电磁的
antenna	[ænˈtenə]	(*pl.* antennae) *n.* 天线
filter	[ˈfiltə]	*n. v.* 滤波器；滤去
relay	[ˈriːlei]	*n. v.* 继电器，中继，接力；转播
segment	[ˈsegmənt]	*n.* 部分，分段；部门
formulate	[ˈfɔːmjuleit]	*v.* 阐述

Notes

① In any case, …. 总之，……；无论如何，……。

1.4 General Knowledge

数学符号及数学式的读法

高等数学、线性代数、复变函数、概率论与数理统计等数学课程被广泛应用于测量与控制领域，专业文献中出现数学公式是常见的情况，下面将介绍一些常用符号和公式的读法：