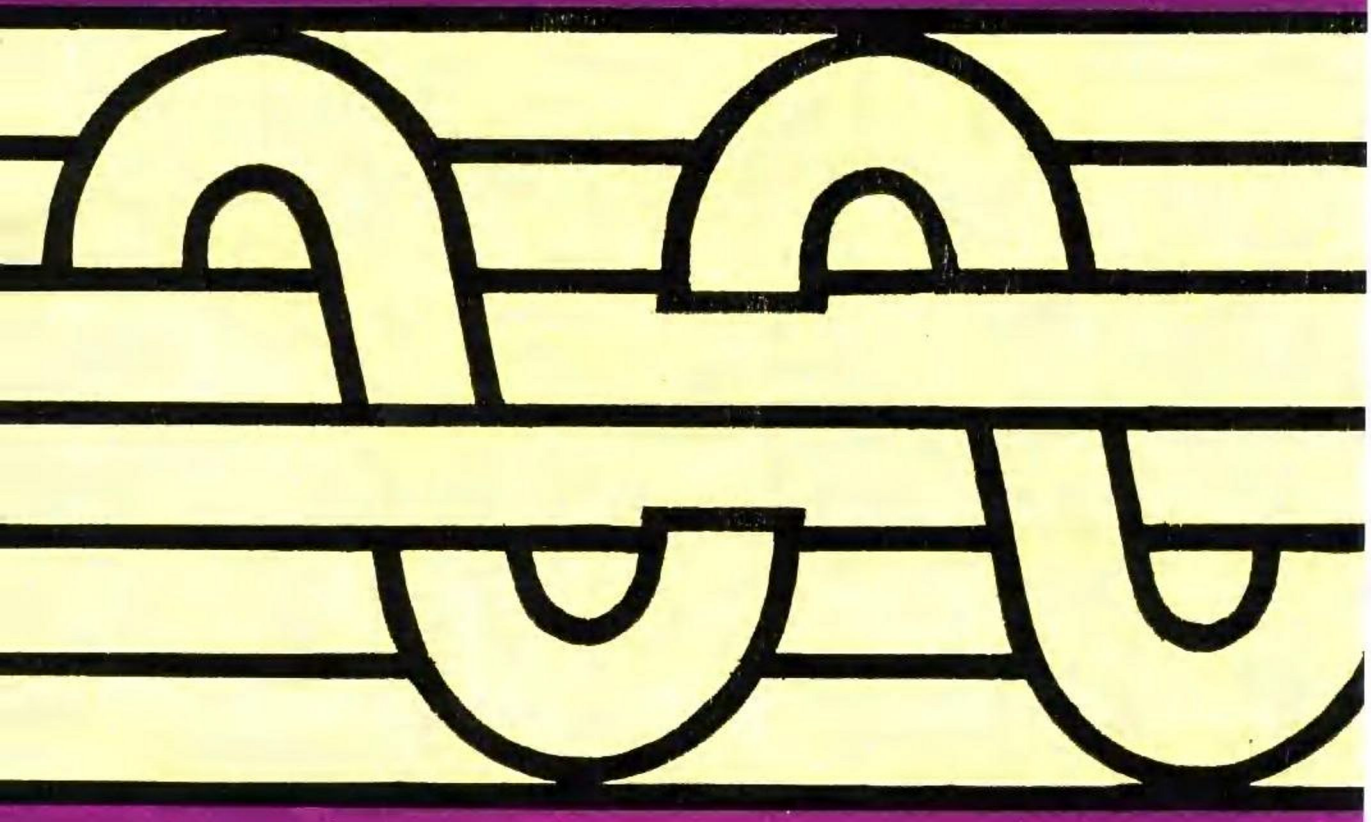
邮电中等专业学校教材

程控交换机专业英语

高廷健 李冰 编



人民邮电出版社

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内 容 提 要

本教材根据邮电部教育司中专教指委“电信类专业英语教学大纲”编写。全书共10单元。各单元分“课文A”、“课文B”、“快速阅读”三部分，书后附词汇总表和专业常用缩略语。“课文A”涉及到程控交换基本原理、主要技术、形成发展、现状与方向，属必修部分；“课文B”则选择了国内引进的几种主要交换机型号的资料，为选修部分。

本教材适合于邮电中等专业学校通信专业的学生使用，也可供科技人员学习参考。

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前　言

随着邮电通信事业飞速发展，新技术、新理论、新装备日新月异，我司原组织编写的中专教材有些内容显得陈旧，难于适应新形势下教学的需要，为此我们对教学大纲进行了修订，并对原教材出版计划做了调整，重点突出了新技术方面的教材。今后将陆续出版。

教材是提高教学质量的关键。编写教材时力求以马列主义、毛泽东思想为指导，运用辩证唯物主义的观点阐明科学技术的规律，内容力求结合实际，提高学生的实践动手能力。

对于书中的缺点和错误之处，希望教师和同学们在使用过程中及时指出，以便修改提高。

邮电部教育司

1994 年 1 月

CONTENTS

Unit 1

Text A

The Slow Push To SPC

All networks, whatever their nature, are made up of branches and nodes. In a telephone network, for example, the nodes are switching centers, and the branches are the transmission links connecting these centers to one another and to subscribers' terminal equipment.

Whereas transmission is a relatively easy concept to grasp, switching is often seen as a complex and somewhat mysterious subject. And yet, switching is just as vital to telecommunication as tranmission. As soon as more than a small number of telephone sets or other terminals are to communicate otherwise than on a purely unidirectional basis as in TV broadcasting, switching must necessarily be provided, in one form or another, since the number of possible terminal-to-terminal connections are growing very rapidly as the square of the number of the terminals. [1]

This need for switching appeared very early in the history of telephony. Just two years after Alexander Graham Bell invented the telephone in 1876, a manual switching office was placed into service at New Haven (Connecticut), the ancestor of all today's telephone exchanges. [2]

Since then, in just over a century, progress has been stupendous. The first major breakthrough in switching techniques was the introduction of automatic switching, following design of the first automatic selector in 1889 by Strowger. However, automatic switching then developed relatively slowly and, even in countries with the highest telephone densities, complete network automation was not achieved until quite recently (1972 in Sweden).

Technological change has been slower in switching than in transmission, where the electronic era began shortly after the turn of the century, following invention of the triode by Lee de Forest in 1906. Serious attempts to employ electronic components in telephone switching did not start until some 50 years later, when it was made technically and economically feasible through invention of the transistor by William Shockley and his colleagues at Bell Telephone Laboratories. [3]

Even so, the true revolution in switching—as in all areas of telecommunication—has been spurred by integrated circuits, first available in the early 1960s, and their offsprings the modern computer and microprocessor. [4]

The development of the electronic computer just before, during, and after World War II stimulated intensive research into the technologies of electronic components and introduced the concept of stored program control into the design of complex systems.

The realization of stored program control in electronic switching system brings the system with many great advantages, and as a result, the designers of electronic switching system in many countries widely accepted the idea that stored program controlled switching (abbreviated as SPC) is the best form at present.

Controlling telephone exchanges is a natural application for digital computers. Initially developed to solve mathematical problems, they can, without difficulty, be used to make complex de cisions in real time when associated with suitable input and output peripherals.

In stored program control, a processor similar to a generalpurpose digital computer is used to control the exchange. Although the program for controlling a telephone exchange is in theory fixed and made up of rather special operations, it can be quite easily implemented by a machine using instructions of a more general nature. This has several advantages. As switching processors need differ little from general-purpose computers, they benefit from technological advances in the computer field. They may have applications outside telephony, leading to a wide market and hence lower costs. And, if the program is stored in a modifiable memory, changes can be made easily, for correcting errors or introducing new functions.

However, telephone switching processors are by no means generalpurpose computers. They are each usually designed for just one or a small family of switching systems. The instruction codes differ, as does memory organization.[5] (The program and data memories are separate in many systems.) And, a different set of peripherals is employed. For example, high-speed printers are only rarely used with telephone processors, but they have special peripherals such as scanners, drivers, and markers for interfacing with the rest of the exchange.

In the same way as for a computer, a switching processor program is a sequence of instructions written in one language (usually a high-level language), then translated by an assembler or compiler into another sequence of instructions that can be directly interpreted by the machine. These machine code instructions are stored in one or more memories. For example, frequently used instructions may be stored in a high-speed main memory, with other instructions stored on a magnetic disk with considerably slower access time.[6] The program may also be copied onto a less expensive medium, as backup in case the normal program is damaged. However, whatever the storage method, the program is a separate entity. The main constituent of the software, it is relatively independent of the rest of the switching system (the hardware), the latter including the actual processor.

Of course, the entire telephone exchange need not be controlled by a single monolithic stored program. To start with, what we have called the 'program' is always divided into many programs, each with a well-defined function. There are, for example, call processing programs, maintenance programs, and traffic measuring programs.

Switching systems are by their very nature extremely complex. This is true irrespective of the type of control. With the advent of stored program control, switching engineers have become involved in writing highly complex software instead of designing highly complex wiring configurations.

However, the level of complexity can be increased more easily with stored program control. The depth of analysis and decision making, the number of functions, and the extent of fault diagnosis can all be greater. The complexity of a hardwired control system is fixed once and for all, but software can always be rewritten if the behaviour or use of an exchange must be modified. This flexibility does not concern just the programs but extends to all the semipermanent data.[7] These data, which change little during the life of an exchange, define its internal configuration and hardware, the types of lines and trunks connected, the routing rules, etc. They are generally stored in memory tables and can be easily modified provided certain precautions are taken.

The main advantages of stored program control in switching system are: the full use of telephone network, flexibility of route selecting, numbering and charging, reduction in size, power-saving and the ease in installing and maintenance, etc. It has also made many new subscriber services possible, such as abbreviated dialing, call waiting, call transfer on busy and three-party call. In addition, because of computer capabilities, an SPC switching system can be served as a data-switching center, and therefore will offer customers still more services including telegraph, videotex and even high speed data exchanging.

New Words and Expressions

branch *n.* 分支;分路,支路,支线
node *n.* 节点,结点;波节
switching *n.* 交换,接续;互换,转换;开关
terminal *n.* 终端,终端设备;端,端子,接头
telephony *n.* 电话学;电话
ancestor *n.* 祖先,祖宗
stupendous *adj.* 巨大的,惊人的
breakthrough *n.* 突破,主要成就
automatic *adj.* 自动的
selector *n.* 选择器;调谐旋钮;转换开关
component *n.* 元件,部件;成分
feasible *adj.* 可行的,可能的,可实现的
spur *v.* 激励,鞭策
available *adj.* 可获得的,有用的,有效的
offspring *n.* 子孙,后代
microprocessor *n.* 微处理机,微处理器
processor *n.* 处理机,处理器;处理程序
stimulate *v.* 刺激,鼓舞,促进
exchange *n.* 交换机;交换局;交换
digital *adj.* 数字的
peripheral *n.* 外围设备 *adj.* 外围的,周围的
instruction *n.* 指令;说明;须知
modify *v.* 修改,变更
modifiable *adj.* 可修改的,可变更的
memory *n.* 存储器;存储
error *n.* 误差,错误,差错;误码
code *n.* 码,电码,代码 *v.* 编码
organization *n.* 组织;结构
scanner *n.* 扫描器;扫描程序
driver *n.* 驱动器;激励器
marker *n.* 标志器
interface *n.* 接口 *v.* 接口
assembler *n.* 汇编语言;汇编程序
compiler *n.* 编译程序
access *n.* 入口,通路;存取,访问
v. 接入;存取
backup *n.* 后备,备用
entity *n.* 实物,实体
constituent *adj.* 组成的,构成的
software *n.* 软件,软设备

hardware *n.* 硬件
monolithic *adj.* 单片的，单块的
maintenance *n.* 维护，保养；保持
traffic *n.* 业务量；话务量；业务，话务
irrespective (～of) *adj.* 不顾，不考虑
advent *n.* 来到，来临
configuration *n.* 配置，结构；外形
fault *n.* 故障，损坏；错误，缺点
diagnosis *n.* & *v.* 诊断，调查分析
hardwire *n.* 硬线，硬布线
behaviour *n.* 性能；行为，举止
flexibility *n.* 灵活性，适应性
semi-permanent *adj.* 半永久性的
internal *adj.* 内部的，内在的
trunk *n.* 中继线；信息通路
route *n.* 路由，路线
precaution *n.* 预防，防备
videotex *n.* 电视图文，电视文稿
Stored Program Control (SPC) 存储程序控制(SPC)
otherwise than … 而不是……
be placed into service 投入使用
integrated circuits 集成电路
as a result 结果
benefit from … 从…中获益
by no means 决不

Notes to the Text

1. As soon as more than a small number of telephone sets or other terminals are to communicate otherwise than on a purely unidirectional basis as in TV broadcasting, switching must necessarily be provided, in one form or another, since the number of possible terminal-to-terminal connections are growing very rapidly as the square of the number of the terminals.

   一旦进行通信(不是像广播电视那样以单纯的单方向为基础的通信)的电话机或其它终端不再是小数目，便需要有某种形式的交换设备。因为端对端连接的可能数是随终端数的平方数迅速增长的。

   as soon as 引导时间状语从句；
   switching must necessarily be provided 为本句主句；
   on …basis：基于…，以…为基础；
   since 引导原因状语从句。

2. Just two years after Alexander Graham Bell invented the telephone in 1876, a manual switching office was placed into service at New Haven (Connecticut), the ancestor of all today's telephone exchanges.

   就在1876年亚历山大·厄莱姆·贝尔发明电话后两年，在纽黑文(康涅狄格州)，一座人工交换局便投入了使用，这是现代电话交换局的始祖。

   Connecticut：美国一州名；
   the ancestor of … exchanges 为 a manual switching office 的同位语。

3. Serious attempts to employ electronic components in telephone switching did not start until some 50 years later, when it was made technically and economically feasible through invention of the transistor by William Shockley and his colleagues at Bell

Telephone Laboratories.

直到约50年后，威廉·肖克利及其贝尔电话实验室的同事们发明了晶体管，从而使电话交换中应用电子元件在技术上和经济上成为可能，人们才开始认真地进行这方面的试验。

when 引导定语从句修饰 some 50 years later；

it 指代不定式 to employ electronic components in telephone switching 所表示的整体概念。

4. Even so, the true revolution in switching——as in all areas of telecommunication——has been spurred by integrated circuits, first available in the early 1960s, and their offsprings the modern computer and microprocessor.

尽管如此，真正推动交换技术革命的，如同电信其它领域一样，是60年代早期出现的集成电路及其产物——现代计算机和微处理机。

first available in the early 1960s 为形容词短语，修饰 integrated circuits；

their offsprings 与 integrated circuits 为并列成分，由 and 连接，作介词 by 的宾语；

the modern computer and microprocessor 为 offsprings 的同位语。

5. The instruction codes differ, as does memory organization.

指令码不同，其存储器结构也不一样。

as does memory organization 为倒装句，相当于 memory organization differs.

6. For example, frequently used instructions may be stored in a highspeed main memory, with other instructions stored on a magnetic disk with considerably slower access time.

例如，常用的指令存在高速主存储器中，其它指令则存放在存取时间慢得多的磁盘里。

with other instructions stored on a magnetic disk 为 with＋名词＋过去分词短语”的分词独立主格结构，作状语；

with considerably slower access time 为 a magnetic disk 的定语。

7. This flexibility does not concern just the programs but extends to all the semi-permanent data.

这种灵活性不单就程序而言，还包括所有半永久性数据。

Exercises

I. Choose the best answer to complete the sentences according to the text:

1. A telephone network is made up of _____.

A. branches and nodes　　B. switching centers

C. transmission links　　D. switching centers and transmission links

2. Which of the following sentences is true? _____.

A. Switching is a concept as easy to grasp as transmission.

B. Switching is just as vital to telecommunication as transmission.

C. Switching is a subject as complex as transmission.

D. Switching is as mysterious as transmission.

3. The history of today's telephone exchanges can be traced back to the year of _____.

A. 1876 B. 1878 C. 1889 D. 1906

4. "Initially developed to solve mathematical problems, they can, without difficulty, be used to make complex decisions in real time when associated with suitable input and output peripherals." Here "they" refers to _____.

A. telephone exchanges B. digital computers

C. mathematical problems D. suitable input and output peripherals

5. In stored program control, _____ is used to control the exchange.

A. integrated circuits B. a general-purpose digital computer

C. a processor D. an input and output peripheral

6. Switching processors _____ from general- purpose computers.

A. need differ little B. need differ a little

C. needn't differ at all D. need differ a lot

7. Telephone processors use high-speed printers _____ scanners, drivers and markers.

A. as often as B. as rarely as

C. not so often as D. not so rarely as

8. Machine code instructions may be stored in _____.

A. memories B. magnetic tape

C. either A or B D. neither A nor B

9. With the advent of stored program control, switching engineers have to _____.

A. write highly complex software

B. write very simple software

C. design highly complex wiring configurations

D. design very simple wiring configurations

10. A SPC exchange's internal configuration is defined by _____.

A. softwares B. hardwares

C. programs D. semi-permanent data

Ⅱ. Translate the following phrases into Chinese:

1. subscribers' terminal equipment
2. a manual switching office
3. telephone exchange
4. countries with the highest telephone densities
5. complete network automation
6. integrated circuits
7. stored program controlled switching
8. general-purpose digital computers

9. input and output peripherals
10. telephone switching processors
11. to interface with the rest of the exchange
12. a sequence of machine code instructions
13. call processing programs, maintenance programs and traffic measuring programs
14. to write highly complex software
15. to design highly complex wiring configurations
16. the depth of analysis and decision making
17. flexibility of route selecting
18. numbering and charging
19. abbreviated dialing, call waiting, call transfer on busy and three-party call
20. a data-switching center

Ⅲ. Translate the following paragraphs into Chinese:

(Ⅰ)

Whereas transmission is a relatively easy concept to grasp, switching is often seen as a complex and somewhat mysterious subject. And yet, switching is just as vital to telecommunication as tranmission. As soon as more than a small number of telephone sets or other terminals are to communicate otherwise than on a purely unidirectional basis as in TV broadcasting, switching must necessarily be provided, in one form or another, since the number of possible terminal-to -terminal connections are growing very rapidly as the square of the number of the terminals.

(Ⅱ)

Basic studies and development for System 12 occurred in the second half of the 1970s. These studies were based on two main premises:

-Digital systems should be designed not just for voice traffic but for an ISDN environment from the start.

-New semi-conductor technology (LSI, VLSI) would become available during the 1980s providing ample computing power and massive memory storage capability.

This initial work was mostly handled by a laboratory in Connecticut USA, with the support of various European organizations. By the end of 1981 a first system was installed in the Belgium network and soon thereafter (1982) 4 additional System 12 exchanges were installed in Germany.

Ⅳ. Translate the following sentences into English:

1. 虽然交换是一个较难掌握的概念,但是对电信专业来说它同传输一样重要。
2. 直至威廉·肖克利及其贝尔实验室的同事们发明了晶体管(人们)才开始认真尝试将电子元件应用于电话交换。
3. 交换处理机决不同于通用计算机。

4. 同计算机一样，交换处理机程序是由一系列指令构成的，机器并不能直接接受这些指令。
5. 电子交换系统实现存储程序控制为系统带来许多好处。
6. 程序是独立于交换系统其余部分的。
7. 该系统的主要优点是减小了体积，节省了功耗，而且便于安装与维护。
8. 程控交换系统可用作数据交换中心。
9. 交换技术的发展得益于电子元件的改进。
10. 最近，一家新的自动交换局投入了使用。

V. Fill in the blanks with the correct words:

What is AXE?

This question may be answered __1__ many different ways. Some would say: "A telephone exchange", while __2__ might be __3__ and say: "A telephone system __4__ serving all types of telecom, networks-national __5__ international." And many of the answers __6__ would be right.

But if the question reads, "What do the three letters 'AXE' stand __7__ ?" there will usually be __8__ answer.

What, then, does "AXE" __9__ ? The answer is that it is just a three-letter code __10__ an Ericsson __11__.

All products, instruments, tools, __12__ made or used __13__ Ericsson are identified __14__ a three-letter code.

The three letters are usually also __15__ by a number to indicate product variants.

Let us now __16__ the first question, "What is AXE?"

__17__ give a comprehensive answer we are going to use a comparative example: we will compare an AXE exchange __18__ today __19__ one of the first AXE exchanges ever installed, __20__ , the Södertälje Exchange just south of Stockholm, which was cut over in 1976.

1. A. of	B. on	C. in	D. with
2. A. others	B. the others	C. other	D. the other
3. A. specificer	B. more specific	C. less specific	D. more specifically
4. A. can	B. which can	C. able to	D. capable of
5. A. but	B. as well	C. but also	D. as well as
6. A. give	B. gave	C. giving	D. given
7. A. by	B. for	C. on	D. in
8. A. an	B. the	C. /	D. no
9. A. meaning	B. means	C. mean	D. meant
10. A. denote	B. denoting	C. denoted	D. being denoted
11. A. produce	B. product	C. production	D. producer
12. A. etc.	B. i. e.	C. e. g.	D. vice versa.
13. A. in	B. on	C. by	D. with

14. A. in	B. on	C. by	D. with
15. A. to follow	B. follow	C. followed	D. following
16. A. to revert to	B. revert to	C. to revert	D. revert
17. A. To be able to	B. Bering able to	C. Been able to	D. Be able to
18. A. to install	B. to be installing	C. installed	D. installing
19. A. in	B. to	C. with	D. on
20. A. that is	B. that	C. which is	D. which

Text B

ITT 1240 Digital Exchange General Introduction[1]

The ITT Digital Exchange is the result of ITT's decision to develop a completely new, digital switching system able to handle both voice and nonvoice services during the future transition to digital network. This major development project - the largest in ITT's history - culminated in an exchange architecture with fully distributed control able to meet local, toll and combined applications over a size range hitherto considered impossible.[2]

ITT's decision to develop a totally new switching system was a major one. It resulted from a choice between three alternatives: continue improving analog SPC systems, being modernizing present SPC system by introducting digital subsystems, or design a wholly new, fully digital switching system.

Both the telephone administration and the telecommunication manufacture benefit from introduction technological advances into existing systems; existing installations can be extended with new technology equipment, which is to the advantage of administrations, while for manufactures this evolutionary approach requires less development investment and manufacturing plant modification. Indeed the history of ITT's PENTAC ONTA (CROSSBAR) and METAC ONTA[3](analog SPC) exchanges illustrates how units based on new technologies can be introduced into existing exchanges (e.g. processor controlled registers and translators for Pentaconta exchanges; a new smaller switching matrix for Metaconta exchanges).

However, at some point in the evolution of technology and subscriber service requirements, it becomes advantageous to initiate a new development landing to a totally new switching system. This point has been reached and the justified direction is now towards a new fully digital exchange employing the latest advances in digital technology. The huge cost of developing a fully digital exchange, the uncertainty of data and other services which will be required in the future, and the unpredictability of technological development mean that a new digital exchange should meet two important design requirements. First it should be able to accommodate new technology and new services without system redesign. Second, existing installations should be extendable with new technology equipment or new services without

rearrangement of installed equipment. Implementation of these requirements has been called simply "future safe design".

The major expected change in subscriber services - the combining of voice and data traffic - is a result of forecast demands for non-voice communication services and studies that have shown the economy of integrating voice and non-voice services on the digital network, forming the integrated services digital network or ISDN. Fully digital exchanges are necessary to exploit the data capacity potential of the 64 kbit/s and 8 kbit/s channels that have been standardized (by CCITT recommendations) for digital telephony and non-voice services. Rather than envisioning an initial transition to the digital voice network (IDN) and then further transition for the integration of services (ISDN), it was considered both necessary and practical from the initial design stages for the new digital exchange to include the capability to carry both voice and data (and other non-voice services)[4]. This capability had to be a basic design feature rather than a future retrofitting procedure.

Recognition that an evolution redesign of present analog SPC system would neither meet the future safe requirement nor make full use of recent microelectronic advances resulted in the decision to develop a wholly new switching system. Once that decision had been made, a study of the capabilities and economics of present and forecast technology was combined with forecasts of voice and data service demand. The results of these studies were a determining factor in the choice of a digital exchange architecture based on fully distributed control - the ITT 1240 Digital Exchange. This method of control has major advantages in terms of the straightforward addition of features, smooth cost profile, acceptance of future components, reliability, and protection against major failure.

At the same time, advances in LSI (large scale integration) technology had made distributed control architectures physically practical and economically advantegeous. Thus the time was right to initiate the largest single development project in ITT's history - the ITT 1240 Digital Exchange.

The articles in this special issue of Electrical Communication cover the broad spectrum of technological advances that have become part of the ITT 1240 development. Included are articles on the exchange architecture hardware, software, equipment practice, product support systems, CCITT No. 7 signalling, traffic handling, operator subsystem, operations and maintenance and installation, and the application of ITT 1240 digital exchange in local and toll networks[5]. This introductory article provides a brief description of the main features of the L240 architecture and discusses the criteria that affected the design.

Development of the ITT 1240 has brought together the expertise and experience of ITT engineers, designers, and scientists in Belgium, France, Germany, Italy, Spain, and the United States, all represented development suitable for worldwide application.

Notes to the Text

1. 本文选自 S1240 培训资料，出自美国通信刊物“Electrical Communication”(Vol. 56 No. 213 1981)

2. This major development project - the largest in ITT's history - culminated in an exchange architecture with fully distributed control able to meet local, toll and combined applications over a size range hitherto considered impossible.

这个主要研制项目——ITT 公司历史上最大的项目，最终产生了全分散控制的交换结构，能在大范围内满足至今认为不可能的本地、长途以及综合应用的需求。

culminated in … 最终产生了

able to meet … 作定语，修饰 distributed control

hitherto 至今

3. PENTAC ONTA　　METAC ONTA

潘泰康塔、米泰康塔，分别为 ITT 公司早期纵横制交换系统和模拟存储程序控制交换系统。

4. Rather than envisioning an initial transition to the digital voice network (IDN) and then a further transition for the integration of services (ISDN), it was considered both necessary and practical from the initial design stages for the new digital exchange to include the capability to carry both voice and data (and other non-voice services).

不是预想先过渡到数字话音网络(IDN)再向综合业务(ISDN)过渡，而是认为新的数字交换从初始设计阶段就含有传输话音和数据(及其它非话业务)的能力是必要而且可行的。

rather than… 不是…而是…

…it was considered both necessary and practical from the initial design stages for the new digital exchange to include…

it 为形式主语，代替真主语不定式 to include…

the new digital exchange 为逻辑主语

5. Included are articles on the exchange architecture, hardware, software …

本句倒装，正常语序应为：

Articles on the exchange architecture, hardware, software, …are included.

包括交换机结构、硬件、软件…等方面的文章。

Exercises

I . Choose the best answer to complete the sentences according to text: