ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ОБРАЗОВАНИЮ

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РАДИОТЕХНИКА

Часть 2

Учебные задания по английскому языку

САМАРА 2006

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Текстовые материалы предлагаемых учебных заданий служат основой для создания словарного запаса специальной лексики, развития навыков чтения, перевода научно-технической литературы, аудирования и говорения, реферирования и аннотирования.

Вся система упражнений направлена на повторение, закрепление и развитие грамматических умений и навыков, а также лексического материала по специальности. В каждом разделе имеется краткий грамматический справочник по изучаемому явлению.

Составлены в соответствии с требованиями программы по иностранному языку для неязыковых специальностей и вузов. Предназначены для студентов 2-го курса специальности «Радиотехника».

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Рецензент Н. Г. С т е п н о в а

UNIT 1

Parts and Components

Grammar: Participle I (Причастие I)

Причастие I – неличная форма глагола, обладающая свойствами глагола, прилагательного и наречия. Причастие I соответствует формам причастия и деепричастия в русском языке. Образуется от основы инфинитива плюс **ing** суффикс (to rain – raining)

Формы причастия

Залог / Причастие	Действительный ACTIVE	Страдательный PASSIVE
Неперфектное (NON – PERVECT)	TRANSLATING	BEING TRANSLATED
	GOING	-------
Перфектное (PERFECT)	HAVING TRANS-LATED	HAVING BEEN TRANSLATED
	HAVING GONE	-------

Неперфектное причастие I обозначает действие, одновременное с действием глагола – сказуемого:

While translating difficult texts we use dictionary. – Переводя трудные тексты, мы пользуемся словарём.

While translating difficult texts we used dictionary. – Переводя трудные тексты, мы пользовались словарём.

While translating difficult texts we shall use dictionary. – Переводя трудные тексты, мы будем пользоваться словарём.

Перфектное причастие I обозначает действие, предшествующее действию, выраженному глаголом – сказуемым.

Having read the book I return it to the library. – Прочитав книгу, я возвращаю её в библиотеку.

Having read the book I returned it to the library. – Прочитав книгу, я возвратил её в библиотеку.

Примечание.

Неперфектное причастие I от глаголов: to see видеть, to hear слышать, to arrive приехать, to come приходить, to enter входить и др.

также может обозначать действие, предшествующее действию глагола – сказуемого:

Hearing the news I ran to tell it to my friend. – Услышав эту новость, я побежал рассказать её другу.

В предложении причастие I употребляется в функции определения и обстоятельства.

1) Определение: Running water is pure. – Проточная вода чистая.

2) Обстоятельство: Having run a long distance the sportsman was tired. – Пробежав длинную дистанцию спортсмен устал.

Exercises.

1. Find participle in different forms and translate:

1. Many countries have cable TV, a system using wires for transmitting TV programmes.
2. The fifth – generation computers performing 100 billion operations second will become available in the nearest future.
3. A videophone is a device which allows us to see a room and the face of the person speaking.
4. Driving a car a man tries to keep steady speed and watch the car in front of him.
5. Having stated the laws of gravity Newton was able to explain the structure of the Universe.
6. Being more efficient than human beings computers are used more and more extensively.
7. Having graduated from Cambridge Newton worked there as a tutor.
8. Having been published in 1687 Newton's laws of motion are still the basis for research.
9. Being invented the digital technology solved the old problems of noise in signal transmission.
10. Having published his book about space exploration in 1895 Tsiolkovsky became known all over the world.

2. Define the form and function of the participle and translate these sentences into Russian:

1. I booked a seat in a jet plane leaving in the morning.
2. They looked at the flying plane.

3. The instrument measuring atmosphere pressure is called a barometer.
4. The stability of the compound being formed must be considered.
5. Having been warmed to 0^{o} ice began to melt.
6. When working with these substances one must be very careful.
7. The acceleration of a body when falling is constant.
8. Giving so much data about planets these experiments are very important.
9. This conference has brought together a large number of researchers working in the rapidly developing area of high-energy physics.
10. The processes occurring in the cell nucleus are not well understood.

3. Translate from Russian into English:

1. Читая эту книгу, он обычно делает заметки (make notes).
2. Прочитав текст, мы обсудили его.
3. Отвечая на вопросы, он сделал несколько ошибок.
4. Являясь хорошим проводником электричества, медь широко используется в промышленности.
5. Увидев зелёный свет, мы перешли улицу.

Active Vocabulary for text A:

Compatible – совместимый
Integrated Circuit (IC) – интегрированная схема
Digital-analog (D/A) converter – аналого-цифровой преобразователь
Tuning – настройка
Camcorder – кодирующее устройство автоматизированного производства
Assure – уверять
Consumption – потребление
Adopt – принимать
Terminal – вывод
Connection – соединение
Dual – In – Line Package (DIP) – плоский корпус с двухрядным расположением выводов

Text A

D/A Converter

Compatible with 2.7 to 3.6 V, the 8 – bit, 12 – channel digital – analog (D/A) converter performs digital tuning in various applications including camcorders. An IC for circuit regulation of electronic devices assures the low operating voltage. The engineers cut the power consumption: to 0.45 m W per channel at 3 V, about 60 percent lower than 5 V standard products. Adopting the R – 2R format, the D/A converter covers 12 channels, each with its own operational amplifier buffer for a sink source current of ± 1 mA. This enables direct driving of large loads. A serial data input system allows control of 12 channels of D/A converters with three terminals Cascade connection is also possible.

The MB88346L comes a 6,5 – 4,4 mm SSOP – 20 format, and in DIP and SOP formats.

1. Find English equivalents for the following Russian words and word combinations:

Сравнимый с; выполняет цифровую настройку; низкое рабочее напряжение; потребление энергии; охватывает 12 каналов; большие нагрузки; позволяет контролировать.

2. Find out the sentence in the text:

12 канальный аналого-цифровой преобразователь сигналов выполняет цифровую настройку различных приборов.

3. Complete the sentence using adjectives: low, electronic.

An IC for circuit regulation of _____ devices assures the _____ operating voltage.

4. Explain the meaning of the technical abbreviation: D/A.

5. Is it right or wrong?

A serial data input system allows control of 6 channels of D/A converter with two terminals.

6.Make up the sentences using these words: power consumption, cut, engineer.

7. Find out all participles I in the text, define their forms and functions in the sentences.

Active vocabulary for text B

Cellular –	сотовый
Delay –	задержка; препятствие
Allow –	позволять
Rechargeable –	перезаряжаемый
Standby –	запасной; резервный
Car-less –	мобильный
Alphanumeric –	алфавитно-цифровой
Simplify –	упрощать
To put in contact –	соединять
Roaming –	распространение
Assistance –	помощь; содействие.

Text B

Cellular Convenience anywhere business takes you.
All the power with more talk time.

Your meeting ran late and your taxi's stuck in traffic. You'll never make your plane! Business travel is filled with unexpected delays.

Now you can call ahead, find a flight and reserve a seat, all on the way to the airport! The Microware car – less Phone provides portable, cellular convenience when you need it, with or without your car.

Our 18.6 ounce Car – Less Phone operates at the maximum 0.6 Watt power allowed for a hand – held portable. It's programmed with a cellular number, ready to use the moment you open the box.

It comes with 2 rechargeable batteries that provide nearly 4.5 hours of talk time or 60 hours of standby. The Car – Less Phone has every feature you'll ever need, from 110 memories, to a user friendly alphanumeric menu for simplified use. The PLUS button puts you in contact with one of our representatives for nationwide cellular roaming or service assistance, airtime free.

1. Give the English ecquivalents for the following Russian words and word combinations:

Командировка; неожиданные задержки; заранее; по пути; переносной; перезаряжаемые батарейки; запас; простое использование; связывают вас с; сервисная служба.

2. Complete the sentence using these expressions: call ahead; on the way.

Now you can ----, find a flight and reserve a seat, all ---- to the airport.

3. Give a situation when you need the Car – Less Phone.

4. Is it right or wrong?

Our Car – Less Phone operates at the minimum 0.6 Watt power allowed for a hand – held portable.

5. Give technical characteristics of this device.

6. Read and translate the text with the help of the the dictionary.

Text C
Oscillator Modules

For use in broadcast and communications satellite receivers, the series of microwave local oscillators feature the smallest, lightest designs in the industry, weighting 4.4 g and measuring 7.5 mm tall. They offer a 1.9 cc volume. There are six models; samples are available. This one operates at 10.678 GHz. The 2^{nd} covers 11.200 GHz, the 3^{rd} works at 11.300 GHz and the 7^{th} accommodates 10.750 GHz. The 8^{th} works at 10.873 GHz, the 9^{th} handles 10.990 Ghz. The excellent performance eliminates the need to adjust the high frequency. As a whole, the modules make it possible to create a miniature outdoor unit for satellite broadcasting. They are suitable for converters in flat antennas, and mount easily on converters.

1. Give the technical characteristics for the best local oscillators.
2. Explain the meaning of the abbreviation: GHz.
3. Is it right or wrong?

There is one model, sample is available.

UNIT 2

E m i s s i o n

Grammar: Constructions with Participle I (Конструкции с причастием I)

Причастие I может употребляться в конструкции «Объектный падеж с причастием I» (the Objective with the Participle I Construction) и в абсолютном причастном обороте (the Absolute Participial Construction).

Конструкция «Объектный падеж с причастием I» во многом аналогична конструкции «Объектный падеж с инфинитивом». Она состоит из личного местоимения в объектном падеже или существительного в общем падеже и причастия I. В этой конструкции употребляется только одна форма причастия I – неперфектное, действительного залога.

Эта конструкция употребляется в функции сложного дополнения после глаголов чувственного восприятия: **to see, to watch, to hear, to feel.** На русский язык конструкция «Объектный падеж с причастием I» переводится дополнительным придаточным предложением.

I saw her crossing the street	Я видела, как она переходит улицу.
I felt my heart pounding	Я почувствовала, как бьется мое сердце.

Это грамматическое явление употребляется, когда говорящий хочет подчеркнуть, что действие, выраженное причастием, не завершено и протекает в момент речи.

Кроме этой, в английском языке существует конструкция, в которой причастие I выражает действие, не связанное с действием, обозначенным глаголом-сказуемым предложения. Это так называемый абсолютный причастный оборот (the Absolute Participial Construction). Он состоит из сочетания существительного в общем падеже (реже местоимения в именительном падеже) и причастия I. В предложении он выступает в роли различных обстоятельств и на письме всегда отделяется запятой от остального предложения. На русский язык переводится соответствующими придаточными предложениями.

The weather permitting, we shall go to the country.	Если погода позволит, мы по едем за город.
It being very cold, we could not go sking	Так как было очень холодно, мы не смогли пойти на лыжах

Exercises

I. Translate the underlined word-combinations:

1. When completed in 1897, Getterson"s building was the largest and costliest library in the world.
2. Though being a school teacher of mathematics all his life, Tsiolkovsky concentrated his attention on man's travel into space.
3. If compared to today's TV programs, the first black-and-white pictures were not very good.
4. While being a teacher of deaf people, Bell became interested in sound and its transmission.
5. Though discovered, Newton's mistake had no influence on his theory.
6. While working at a new transmitter for deaf people, Bell invented a telephone.
7. If heated to 100^{o} C , water turns into steam.

II. Find out the subject of the Absolute Participial construction, translate the sentences:

1. Numerous experiments having been carried out at the orbital stations, it became possible to develop new methods of industrial production of new materials.
2. President Jefferson having offered his personal library, the foundation of the Library of Congress was laid.
3. A beam of light being transmitted forward, it is possible to measure the distance between the car and the other cars in front of it.
4. The distance having been measured, the computer adjusts the car's speed.
5. Two metallurgists produced a new superplastic metal, the new steel showing properties identical to Damascus steel.
6. The young physicist having discovered Newton's error, other scientists confirmed it.
7. The first TV sets having been shown in 1939, the news about it spread throughout the world.

III. Translate the sentences paying attention to the Absolute Participial Construction:

1. Two objects having the same temperature, the average energy of motion of their molecules is the same.
2. Part of the energy of the battery is transformed into electric energy.
3. Average temperature between 200 and 250^{o} C having been maintained for several hours, a new artificial synthetics fibre was obtained.
4. All machines that have ever been built by man have some energy "loss", this energy being converted into useless heat due to friction.
5. Different molecules have different speeds, the average speed of all molecules remaining the same, as long as the temperature is constant.
6. One scientist after another have tried cooling some gas to absolute zero, their attempt coming to nothing.

Active vocabulary

Emission	излучение
Sufficiently	достаточно
To strike	ударяться, сталкиваться
To knock	ударять(ся)
To give up	отдавать
To liberate	освобождать, выделять
Average	средняя величина
Surface	поверхность
To escape	улетучиваться, ускользать
To overcome	преодолеть
To depend upon	зависеть от
To involve	включать в себя
Restraint	сдержанность, ограничение
Residual	остаточный

I. Read and translate the text.

Text A

Emission

The emission of electrons from metals can occur in several ways. If a metal is heated to a sufficiently high temperature emission will occur. This is known as primary or thermionic emission. Secondary emission is that which occurs when high-velocity electrons or ions strike a metal and

knock out other electrons. Emission may also occur when light rays strike a material and give up energy that liberates electrons; this is known as photo emission. Thermionic and secondary emission are of most importance in ordinary vacuum tubes.

In any conductor there are a large number of free electrons moving around with various velocities. As the temperature of the conductor increases the average velocity of the free electrons increases. At the surface of the conductor there exists a restraint upon the movement of the electrons in the form of an electrostatic gravitational force. Were it not for this all the electrons in the metal would soon escape. As it is, only those having enough energy to overcome the surfaces manage to get away. The energy in electron volts that an electron must have before it can leave a metal is known as the work function of the metal. It would be expected that the emission of electrons would depend upon the temperature of the metal and the work function of the particular metal involved. This is found to be the case.

The only metal other than tungsten that has possibilities as a practical emitter is tantalum. Although tantalum cannot be made as hot as tungsten because its melting temperature is 3300 k, compared with 3655 k for tungsten, its work function is sufficiently lower, so that at any temperature less than 2500 k, its emission is at least 10 times that from tungsten. A disadvantage of tantalum is that it is easily contaminated by residual gases, which form oxides that greatly reduce the emission.

II. Find the English equivalents for the following Russian word combination:

Несколькими способами; достаточно высокая температура ;выделяет энергию; высвобождает электроны; обычные вакуумные лампы; средняя скорость; ограничение в движении; электростатическая сила притяжения; по сравнению с; в 10 раз.

III. Fill the words into the blanks:

1. If a metal is heated to a sufficiently high temperature _____ will occur.
2. Thermionic and secondary emission are of most importance in _____.
3. As the temperature of the conductor _____ the average velocity of the free electrons _____.

4. The emission of electrons would depend upon the _____ of the metal and the work function of the particular metal involved.
5. The only metal other then tungsten that has possibilities as a practical emitter is _____.

IV. Group the words, make up word combinations:

emission	force
average	function
practical	temperature
residual	gases
melting	emitter
work	of electrons
gravitational	velocity

V. Explain the cases when the emission of electrons from metals occurs.

VI. What is the theory of emission? (Find out and read this abstract in the text)

VII. What is the disadvantage of tantalum compared with tungsten?

VIII. Read and translate the text.

Text B

Physical properties of electrons and ions

For purposes of radio engineering the most fundamental particle is the electron. The electron is the smallest particle that constitutes most of the current flow encountered in vacuum tubes. It is the negative planetary particle of the hydrogen atom.

Another fundamental particle is the proton. The proton is the positive nuclear particle of the hydrogen atom. It has the same magnitude of charge as the electron, but its charge is positive, whereas the charge of the electrons is negative. The mass of the proton is roughly 1,800 times that of the electron.

Other charged particles called ions may exist. These are usually created from a normal atom or molecule by the addition or removal of one or

more electrons or protons from its structure. The mass of such ions is always much greater than that of the electron, and their charge is an integral multiple of the charge of the electron and is not restricted to the negative sign.

1. What is the subject of the text?
2. Characterise the electron, proton and ion.

Read the text and translate it with the help of a dictionary.

Text C
Tube noise

Vacuum tubes act as sources of noise because of the inherent electronic nature of their operation. The current consisting of the movement of discrete particles known as the shot effect, noise arises. Noise will also arise from variations of the division of current between elements in multi-electrode tubes.

The electrons being discrete particles emitted from the cathode in a random way, the shot effect is noise. Any current resulting from such emission has a random or statistical variation that is termed “noise”.

The shot noise depends upon the conditions under which this current flows. The noise for a given current is maximum when the plate is absorbing all the electrons that are liberated by the cathode, i.e., when the emission is temperature limited. If the plate does not receive all the electrons emitted by the cathode, the noise is much less because of a cushioning effect upon the variations in the rate of emission produced by the great number of electrons emitted.

1. What is the shot effect?
2. What sources of noise in tubes do you know?
3. Find out all participles and participial constructions in the text, define their forms and functions in the sentences.

UNIT 3

Communication Satellite Systems

Grammar : Participle II (Причастие II)

Причастие II (Participle II), третья основная форма глагола, имеет одну неизменяемую форму со страдательным значением и обозначает действие, которое испытывает на себе лицо или предмет. Оно соответствует в русском языке причастию страдательного залога.

Причастие II правильных глаголов образуется с помощью суффикса **- ed : to ask – asked ; to end – ended** и т. д.

Причастие II неправильных глаголов следует запомнить, оно дается в словаре как третья основная форма глагола: **to write – written; to do – done** и т.д.

Причастие II главным образом употребляется для образования аналитических глагольных форм :

1. Страдательного залога :

Houses are **built** quickly. Дома **строятся** быстро.

2. Перфектных форм :

I have **known** him for three years. Я **знаю** его три года.

Подобно причастию I, причастие II обладает свойствами глагола, прилагательного и наречия. Как и глагол, оно обозначает действие.

В английском языке существует только одна форма причастия II, а время действия, обозначенное ею, определяется временем действия глагола – сказуемого или контекстом.

Например:

The book **discussed** at the lesson yesterday deals with the problem of war.	Книга, **обсужденная** на уроке вчера, связана с проблемой войны.
The books **discussed** at the lessons are always interesting.	Книги, **обсуждаемые** на уроках, всегда интересны.
The books **discussed** last year were interesting.	Книги, **обсуждавшиеся** в прошлом году, были интересными.

Причастие II выполняет функции различных членов предложения:

1. Определение:

A **written** letter lay on the table.	**Написанное** письмо лежало на столе.

2. Именная часть составного именного сказуемого:

She looked **surprised**.	У нее **был удивленный** вид.
The door is **locked.**	Дверь **заперта.**

3. Часть простого сказуемого :

The poem **was learnt** by the pupil by heart.	Стихотворение **было выучено** учеником наизусть.
He **has** just **come.**	Он **только что пришел**.

4. Обстоятельство:

When **given** time to think, he always answered well.	Когда **ему давали** время подумать, он всегда хорошо отвечал.

EXERCISES

I. Define participle II and translate sentences:

1. The first television set produced quite sensation in 1939.
   The first television set produced in 1939 was a tiny nine – by twelve inch box.

2. Newton's great work published in 1687 is called "Principia".
   Newton published his great work "Principia" in 1687.

3. The Russian Chemical Society organized more than a century ago is named after Mendeleev.
   The Russian Chemical Society organized an international conference devoted to the latest achievements in organic chemistry.

4. The energy possessed by the body due to its position is called the potentional energy.
   The new materials possessed good qualities.

5. The equipment required to perform laboratory experiments was very complex.
   The equipment required further improvement.

II. Translate the following sentences paying attention to the forms and functions of the participles:

1. An external force applied to a body sets it in motion.
2. Any applied force sets the body in motion.
3. The given examples proved the validity (действительность) of the new theory.
4. The validity of the new theory is proved by the examples given below.
5. For every action exerted on a body there is an equal and opposite reaction.
6. It is known that an external unbalanced force sets a body in motion.

III. Translate the following sentences and state the functions of the participles.

1. The experiment is completed.
2. The problem seems solved.
3. Many problems about electricity are still unsolved.
4. They have arrived at similar conclusions.
5. Similar results have been achieved by two experimentators in the course of their work.
6. He had observed many phenomena before he came to a definite conclusion.
7. When the experiment had been finished, the results obtained were compared.
8. His experiment will soon be completed.

IV. Compare the translation of Participle I Passive and Participle II in the following sentences :

1. The installation (being utilized (now); (utilized (usually)) is very efficient.

2. The energy (being produced; produced) was of great importance for our town.
3. The engine (being examined; examined) wi11 be installed in our workshop.
4. (Comparing; having compared) the forces acting on the body the engineer will determine the resultant.
5. (Being heated; when heated) to a sufficient temperature semiconductors begin to conduct electricity.

Vocabulary.

1. division	деление
2. multiplex	сложный
3. baseband	основная полоса прохождения
4. combination	соединение
5. carrier	носитель
6. interconnection	взаимосвязь
7. thereby	поэтому
8. additional	дополнительный
9. access	доступ
10. via	через
11. path	прохождение, путь
12. interference	помеха
13. malfunctioning	неисправная работа

I. Read and translate the text:

Text A:

Satellite Communication Equipment

Two possible designs of satellite communication equipment are discussed below. Both are based on the use of frequency – division multiplex telephone channels, with frequency modulation of the radio carriers.

Design A provides demodulation to baseband in the satellite of blocks of f.d.m. channels from the various.

Earth stations, combinations of several blocks of channels in a common baseband, modulation on the same carrier using f.m. and amplification in a travelling – wave tube or equivalent solidstate device.

This design also provides interconnections in the satellite between a number of channels from high-capacity to low-capacity stations, thereby

avoiding the use of additional radio frequencies for this purpose and making all the low-capacity r.f. access channels available to low-capacity stations.

Design B provides translation of the f.d.m. – f.m. signals from the various Earth stations to i.f. in the satellite, with upconversion to r.f. via varactors or equivalent solid – state devices, the signals from the earth stations travelling via independent parrallel paths in the satellite. This scheme does not provide high-capacity to low capacity station interconnection, but could be used with forms of modulation other than f.d.m. – f.m. if desired.

Designs F and B are both based on the use of multiple narrow-band access channels in the satellite for multichannel telephony, thus reducing the risk of a single interfering transmission, e.g. a malfunctioning earth-station transmitter, affecting all the telephony channels. Furthermore, this feature increases overall reliability, since one or more of the access channels can be designated as a standby, available for use by the appropriate change of earth-station transmitter and receiver frequencies.

II. Find the English equivalents for the following Russian word-combinations:

- Основываются на использовании
- Радионосители
- Соединение нескольких блоков каналов в обычную полосу частот
- Конструкция обеспечивает
- Ряд каналов
- Избегая использования
- Каналы с низкой емкостью доступа
- Проходящие через отдельные параллельные пути

III. Fill the word into the blanks:

1. Designs of satellite communication equipment are based on …
2. Design A provides interconnection in the satellite between a number of channels from _____to_____stations.
3. Design B provides translation of the_____signals from the various earth stations to_____in the satellite.
5. _____reduces the risk of a single interfering transmission, e.g. a malfunctioning earth-station transmitter.

IV. Group the words, make up word combinations:

Multiplex	Transmission
Additional	Device
Parallel	Transmitter
Multichannel	Channels
Solid-state	Paths
Interfering	Telephony
Malfunctioning	Frequencies

V. What is the difference between designs A and B of satellite communication equipment? (Compare design A and B)

VI. What is one common feature which increases overall reliability of the satellites?

VII. Read and translate the text:

Text B:

Communication Satellite Systems.

In the light of the present limited knowledge and practical experience of the many factors involved, it is not possible, at this stage, to define the form of a global system which may eventually be developed. However, it would appear from the foregoing considerations that there would be merit in the further study of a system in which 12 active, station-keeping satellites are established in a circular equatorial west-east orbit at 14 000 km light. The actual orbital period is assumed to be adjusted accurately to 8h, each satellite being seen by an observer on earth twice per day at the same local times each day. By using a high-precision launching technique and control jets on the satellites, it would appear that errors in angular separation of the satellites need not exceed a few degrees over periods of several years.

The number of satellites (12) required in such a system depends on the longest distances to be spanned by a single satellite link, e.g. Europe to N. America.

It is envisaged that the worldwide coverage of the system could be divided into seven overlapping zones, each spanning up to some 70 degrees of longitude and up to about 4-5 hours of local time. All stations

in a given zone would use the same satellite at the same time. All stations within a zone would thus be in single-hop communication with each other, zone-to-zone communication being carried out via interconnection earth stations. Most international connections could be established via not more than two satellite links and one interconnection earth station.

1. What is the subject of the text?
2. What is the principle of operation of the global communication satellite system?

Конструкции с причастием II

1. Объектный падеж с причастием II (the Objective with the Participle II) – причастием II называют действие, направленное на лицо или предмет, выраженные личным местоимением в объектном падеже или существительным в общем. Эта конструкция употребляется как сложное дополнение и переводится на русский язык придаточным дополнительным предложением.

Например:

I heard his name mentioned several times.	Я слышал, как его имя упоминали несколько раз.
I want the letter sent at once.	Я хочу, чтобы письмо сразу не отослали

2. Абсолютный причастный оборот с причастием II (the Nominative Absolute Participle Construction) – состоит из двух частей. Первая выражена личным местоимением в И.П. или существительным в общем падеже, которое обозначает лицо, претерпевающее действие, выраженное причастием II, т.е. второй частью конструкции. На русский язык переводится обстоятельственным предложением.

Например:

My task finished, I went to bed.	Когда задание было выполнено, я пошла спать
His question unanswered, he couldn’t go away	Так как на его вопрос не ответили, он не смог уйти

I. Analyze and translate the following sentences paying attention to the objective participle construction:

1. I heard him speaking at the meeting.
2. They observed us making experiments.
3. I found him writing a report.
4. We saw the device tested.
5. We watched the car being examined.
6. I had the results of my observations published.
7. We want our translations corrected.
8. He wishes these photoplates developed.
9. She got her photo taken.
10. He got the engine of his car examined.

II. Translate the following sentences paying attention to the adverbial modifiers.

1. Though conducted with great care the test did not give the expected results .
2. When expressed in the terms of mass and force Newton's three laws serve as a basis for the general study of motion.
3. Unless stopped by some external force, the body will keep moving due to inertia.
4. If emitted by a strong source of light, the rays would cast bright light on the objects a considerable distance ahead.

UNIT 4

I Grammar: The Gerund, The Verbal Noun
II Reading: Computers

I Grammar Module.

Герундий – неличная форма глагола, выражающая название действия и обладающая как свойствами существительного, так и глагола. В русском языке герундия нет. В английском же языке герундий встречается часто. Глагольные свойства герундия выражаются прежде всего в том, что он имеет формы времени и залога.

Залог / Группа времен	Active (действительный)	Passive (страдательный)	Выражает действие
Indefinite	asking	being asked	не связанное с определенным временем или одновременное действию, выраженному сказуемым
Perfect	having asked	having been asked	предшествующее действию, выраженному сказуемым

Каковы же свойства герундия как существительного? Прежде всего, герундий, как и существительное, может сочетаться с предлогом и определяться притяжательным местоимением или существительным в притяжательном падеже.

The teacher insisted on our coming in time.

Кроме того, обладая свойствами существительного, герундий выполняет в предложении следующие функции:

1) *Подлежащего*

Your studying much now will help you in your future work. – То, что вы сейчас много занимаетесь, поможет вам в вашей будущей работе.

2) *Именной части сказуемого*

to be + прилагательное
существительное
числительное

Her aim was obtaining these data. – Ее целью было получение этих данных (obtaining – именная часть сказуемого).

Герундий может употребляться в функции именной части сказуемого с предлогами against, for, с выражениями to be on the point, to be far from.

3) *Без предшествующего предлога герундий чаще всего употребляется как часть составного глагольного сказуемого* с глаголами, выражающими начало, конец и продолжение действия:

He began developing a new program. – Он начал разрабатывать новую программу.

The teacher told me to go on reading. – Учитель сказал, чтобы я продолжал читать.

4) *Прямого дополнения после глаголов:*

a) to enjoy, to like, to dislike, to hate, to mind, to intend, to prefer, to require, to delay, to remember, to mention, to mean, etc.

I remember having told you about it. – Я помню, что говорил вам об этом.

b) с прилагательными worth (стоящий) и busy (занятый) + глагол-связка be.

This compact disk is worth buying. – Этот компакт-диск стоит купить.

5) В функции предложного косвенного дополнения герундий употребляется после глаголов, прилагательных и причастий, требующих определенных предлогов:

to be fond of;
to result in;
to be interested in;
to be engaged in;
to hear of;
to think of;
to be capable of;
to count on;
to insist on;
to object to;
to get used to;
to prevent from;
to persist in;
to be responsible for;
to proud of и некоторых других.

When do you think of going there? – Когда вы думаете туда поехать?

6) В функции определения герундий чаще всего употребляется с предлогами *of* и *for* после существительных:

This method of testing new devices is quite good. – Данный метод испытания новых приборов довольно хорош.

Однако, наличие предлога *in* после существительных *experience, interest, skill* и предлога *at* после слов *astonishment, surprise, disappointment* указывает на то, что функция герундия – определение.

7) В функции обстоятельства герундий употребляется со следующими предлогами: on/upon (по, после), after (после), before (перед), in (в то время как), by (путем, при помощи), besides (кроме), instead of (вместо), without (без), apart for (помимо) и некоторыми другими.

On receiving wrong results one must repeat the experiment. – Получив неверные результаты, необходимо повторить эксперимент.

Перевод герундия на русский язык

На русский язык герундий переводится:

- именем существительным;
- инфинитивом;
- деепричастием;
- придаточным предложением.

Отглагольное существительное

От герундия в форме Indefinite необходимо отличать отглагольное существительное, которое также оканчивается на – ing.

Отличия:

1) наличие артикля;
2) наличие множественного числа;
3) может определяться прилагательным;
4) не имеет форм времени;
5) не имеет прямого дополнения;
6) не выражает залога.

Exercises

I. Read and translate the following sentences paying attention:

a) to the forms of the gerund.

1. Studying well is the duty of every student. 2. We know of his having mastered this subject. 3. He likes asking all sorts of questions, but he does not like being asked questions. 4. We have heard of Newton’s having

been suggested to put down on paper his ideas, which he did. 5. We know of any object being prevented from moving at constant speed by air friction.

b) to the function of the gerund.

1. The aim of studying foreign languages is receiving more information on one's speciality. 2. You must avoid making mistakes in your translation. 3. The rules of operating this machinery are very simple. 4. He insists on his device being tested. 5. One cannot carry out experiments without lab technique having been mastered well enough. 6. Making numerous experiments helps in acquiring a thorough knowledge. 7. Meteorologists also used the Kelvin scale in many calculations to avoid using negative numbers in their computations. 8. This parasitic capacitance is very small but is the value needed for coupling high frequency noise to ground. 9. The fundamental job of a computer is processing information. 10. A low-pass filter prevents very high frequencies from triggering the flip-flop. 11. The major problem in using them for computation was the lack of a practical optical-switching device. 12. These both units lack a hard drive, which is appropriate since Internet appliances aren't meant for storing letters, budgets and so on. 13. Without a hard drive, there's no waiting for the device to "boot up" when you turn it on. 14. Prevent mixing these substances.

II. Translate the following sentences. State whether a gerund or a verbal noun is used.

1. Excuse me for having kept you waiting. 2. Computers are widely used for controlling industrial processes. 3. The stereo receiver has to extract this subcarrier and pilot signal, process them to recover the (L-R) difference signal as audio, and then perform the adding and subtracting to obtain the separate L and R channels. 4. The computer is able of performing such operations as addition, subtraction, multiplication, division, square rooting and certain logical operations as well. 5. The readings should be the same as in the previous test. 6. The coding of instructions is done by the operator.

III. Put the verbs in brackets in the appropriate gerund form.

1. (Design) medical devices is truly a multidisciplinary exercise.
2. A group of scientists was studying the benefits of (replace) people with robots in the office.

3. After (exam) the machine carefully he began to repair it.
4. I don't remember (mention) this problem before.
5. Before (touch), (probe), or (unsolder) any component, make sure the equipment is unplugged and any large capacitors have been safely discharged.
6. We know of this electrical engineer's (design) a new type of digital computer.
7. Newton succeeded in (formulate) the three laws of motion by virtue of his experimental ability.

IV. Translate the sentences from Russian into English using the appropriate form of the gerund.

1. Многие конструкторы занимались разработкой этого прибора.
2. Память используется для хранения информации.
3. Робот должен быть надежным и обладать способностью выполнять свою работу без сбоев.
4. Тестирование видеокарты может быть произведено несколькими способами.
5. Прежде чем предложить свою идею, он взвесил все «за» и «против».

Vocabulary.

1. sensor – датчик, преобразователь, устройство считывания
2. axis (pl. axes) – ось
3. to decode – декодировать
4. to drive – управлять
5. to bounce off – отскакивать
6. input device – устройство ввода данных, вводное устройство
7. to cause – вызвать, быть причиной
8. cursor – курсор

V. Warm-up

1) What input devices are used to control the cursor and select items on the screen?
2) What other types of input devices do you know?
3) Name their peculiarities.

VI. Reading

A. Read the text and choose the best title for it.

1. Going to the ball
2. De´ja` Vu
3. Synthetic Mouse Guts

Text A

From a design standpoint, a mouse is a fairly simple device. A small ball in the base rolls over the surface of a mouse pad. Two sensors in the mouse – one for the X- Axis and the other for the Y-Axis— feel movement in these axes. They then generate a signal that is sent to the PC and decoded to drive the cursor in a vertical/horizontal direction on the screen.

An optical mouse works pretty much the same way, except that it doesn't need a special surface that provides the traction required to turn a ball in the base. Instead, two beams of light are bounced off any surface the mouse is moved on, with photoelectric sensors tracking X and Y-Axis movement. The biggest problem with the mouse is that it requires a fair amount of desk space to operate. Even if you have one of the new optical mice, you'll still need the better part of a square foot of clear desk space to move it in. There are lots of helpful accessories available, including wrist supports for keyboards and special mouse pads with a support that places your wrist in a less vulnerable position. With the growing amount of computer use these days, that cute-sounding little input device is causing more distress than its namesake in the form of RSI. It seems like even mechanical mice can be somewhat harmful to your health.

Perhaps one of the best ways to cut down on wrist strain, however, is a mouse alternative that’s been available all along—the trackball. Actually, the trackball (a small device with a ball sticking out of it that moves a screen cursor when rolled) was in use as a cursor-control device long before the mouse was even thought of.

With the original air-traffic-control computers and those computers originally used in missile tracking and defense, the preferred input device either a light pen or a trackball.

It wasn't until Doug Engelbart (a scientist at the Stanford Research Institute in Menlo Park, California during the 1960s) turned the trackball upside down, that the mouse was born.

Still, trackballs never quite disappeared from the scene, they proved much less popular with users than the mouse. For one thing, they were somewhat clunky, with most mice offering considerably more precision in positioning the cursor. For another, they were not quite as intuitive to use. With a mouse, when you move your hand, the cursor moves. With a trackball, you move the ball with your finger-tips or thumb—it's a much more subtle correspondence.

B. Using the information in the text, complete these statements.

1. From a design standpoint, a mouse is _____
2. Two sensors in the mouse _____ feel movement in these axes.
3. An optical mouse doesn't need a special surface that provides _____
4. There are lots of helpful accessories available _____ that places your wrist in a vulnerable position.
5. The trackball is _____.
6. The trackball was in use _____.
7. Trackballs proved much less _____.

C. Read the words. Point out suffixes. Give the initial forms of the following words. Translate them into Russian.

decoded, required, helpful, accessories, including, causing, harmful, considerably, correspondence, fairly, axes, biggest, better, originally, less, users.

D. Match the descriptions with the words on the right.

1. a small input device with a ball underneath that is rolled by the user to specify the position of the cursor or to make choices from the menu.	to generate
2. units of hardware which allow the user to enter information into the computer	trackball
3. to cause, to produce	mouse
4. to spring back or up again after hitting a surface	input devices
5. a stationary device that works like a mouse turned upside down.	to bounce off

E. Give Russian equivalents:

mouse pad, mouse gut, vertical/horizontal direction, beams of light, accessories, wrist support, trackball.

F. Give antonyms using prefixes “dis”, “de”, “un”, “non”.

to generate, available, to appear, to code, helpful.
Make up sentences with these words.

Translate the text for 45 minutes.

Text B

The recent resurgence in trackballs is largely the result of new products introduced by two giants—Microsoft and Logitech. Both of these companies have re-engineered the trackball using optical technology and a specially printed ball. The designs from both vendors bounce beams of light off the ball. These beams track both fore and aft movements, as well as side-to-side movement, to derive the actual direction that you are trying to move the cursor on the screen. Resolution is very fine, in fact much greater than most mice.

Microsoft produces a pair of optical trackballs, the $49 Trackball Optical and the $79 Trackball Explorer. Both use the same optical-tracking system and the same scroll wheel that Microsoft now offers in its IntelliMouse. The largest difference is in the placement of the large ball. The less expensive Trackball Optical is designed to put the ball under your right thumb. The two buttons are pretty much in the same place that they are placed on a standard mouse. In the more expensive $70 Trackball Explorer the trackball is placed in the center of the device.

Logitech has three new models, the Cordless TrackMan FX, Cordless TrackMan Wheel, and Marble Mouse USB. The major differences between the $79 TrackMan FX and $59 TrackMan Wheel are the placement of the large trackball. As with the two Microsoft models, the more expensive TrackMan FX places the ball in the center of the unit, where both left- and right-handers can use it easily. The less expensive TrackMan Wheel is designed very much like a standard mouse, with the trackball under the thumb of a right-handed user.

UNIT 5

I. Grammar Module: General Review of the Gerund and Participle I

Герундий отличается от причастия (Participle I) по следующим признакам:

1. наличие перед герундием предлога;
2. перед герундием может находиться относящееся к нему существительное в притяжательном падеже;
3. перед герундием может находиться относящееся к нему местоимение в притяжательном падеже;
4. наличие перед герундием отрицательного местоимения;
5. по функциям.

Сравнение функций Participle I и Gerund

Члены предложения	Participle I	Gerund
1. Подлежащее	_____	+
2. Дополнение (прямое или предложное)	_____	+
3. Часть простого сказуемого	+	____
4. Часть составного глагольного сказуемого	_____	+
5. Определение	сущ+PI	сущ+of+ger
6. Обстоятельство	With (союз)+PI	предлог+ger

Exercises

I. Read and translate the sentences paying attention to the various uses of the Gerund and Participle I/

1. Having proved the validity of this theory, Newton went on working on it. 2. Having investigated the behaviour of steel under heat treatment, P.Anosov wrote a paper describing the hardening of steel in dense air. 3. It was Dmitri Mendeleyev, a Russian scientist, who succeeded in building up a workable periodic classification of all then known elements by arranging them in a table. 4. Making experiments the investigators cor-

related systematically the atomic weights and the properties of existing elements. 5. Being acted upon by some external unbalanced force, a body changes its state of rest or uniform motion. 6. On being set on a proper orbit completely free from the Earth's gravitation a satellite keeps on moving forward through space. 7. While Newton was studying at Cambridge his favourite work was experimenting. 8. Designing medical devices is truly a multidisciplinary exercise.

II. Complete these sentences supplying the necessary prepositions and using the gerund of the verbs in brackets.

1. The scientists persisted … (try) …
2. Our team is engaged … (develop) …
3. I'm rather interested … (make) …
4. We heard … (get) …
5. They objected … (sign) …
6. We insisted … (inform)...
7. Who is responsible … (test) …
8. Soon he will get used … (go) …
9. This girl is proud … (be) …

III. Put the words in the right order to make a statement or a question:

1. one, history, the, occupations, ancient, is, engineering, of, most, in.
2. the, of, based on, branches, what, engineering, were, early?
3. a, specific, engineering, but, single, of, not, is, action, combination, a, actions.
4. the, main, steps, are, for, problem, engineering, solving, any, what?
5. should, take, responsibility, an, engineer, for, goal, his, achieving.
6. the, getting, engineers, results, best, succeed, can, in, many?

IV. Match a line in A with a line in B to complete a sentence. Define the functions of the gerund.

A	B
1. Researchers in the Superconductivity Technology Center have developed a new process	a. for viewing at tailgate parties. b. in determining the best processes and equipment.

2. Another two monitors are installed on motorized mounts that allow them to be raised	c. from getting there, either absorbing it or permitting it to pass through to somewhere else.
3. Things can be improved	
4. Learning about the IBM keyboard interface doesn't limit you to	d. using the keyboard itself.
5. We decided to go all the way: bump up the RAM from 32 MB to 96 MB, upgrade to Windows ME, and replace the hard drive with a 20-GB model.	e. for producing high-performance tape that operates at the temperature of liquid nitrogen.
6. An engineer may use his know-how	f. by connecting a large capacitor across the DC output.
7. A reflective switch reflects the signal beam to a destination or prevents it.	g. after looking at what the upgrades would cost.

V. Complete the following sentences.

1. Avoid using hot-wire instruments, for …
2. Chemists succeeded in …
3. Increasing the security of the communications link….
4. Maintaining the optical and mechanical perfection of the telescope …
5. By displaying the data we can receive …
6. With exchanging the information the scientist can outline …
7. In replacing the charged particle in the electric field …
8. Water, like other substances, expands …
9. Heat was once considered as …
10. Phosphorus burns in chlorine without …

Vocabulary

1. to upgrade – улучшать, модифицировать
2. to replace – заменить
3. CPU – центральный процессор
4. to advance – развивать, совершенствовать
5. performance – работа, производительность, эффективность

VII. Warm-up

Which area of a PC seems to get upgraded the most often? Why?

VIII. Reading

A. Read the text to check your answer.

Text A

Video Cards

One of the biggest benefits of modular computer design is that you can upgrade specific areas of a PC without having to replace the entire computer.

The one area of a PC that seems to get upgraded the most often is the video card. The reason for this is pretty simple—no other subsystem (except, perhaps, the CPU itself) continues to advance in capabilities so rapidly. The major video chipset vendors, including Nvidia and ATI Technologies, seem to be bringing out a new generation of chipsets every six to eight months. Each generation provides not only better performance than the previous one, but improved graphics capabilities.

It wouldn't really matter much, except that game developers are quick to take advantage of these improved capabilities. Since game players make up a large percentage of those PC users in the market for video-system upgrades, a new video card every six, eight, or twelve months seems to be pretty common.

B. Decide whether these statements are true or false according to the text.

1. The biggest benefits of modular computer design is that you can upgrade specific areas of a PC replacing the computer.
2. Each generation of modular computer provides better performance than the previous one.
3. A more comprehensive set of a video benchmarks is available from a MadOnion company.

C. Highlight the word or phrase in the text that means the same as each of the following:

1. to keep in a good condition by making repairs to it and taking care of it.
2. to improve, to develop.

3. to introduce for sale.
4. to change one thing for another, often better or newer.
5. to add or replace hardware or software in order to expand the computer's power.
6. the ability of a machine to do something well.

D. Give derivatives. Translate them.

To compute, to advance, to provide, to improve, to upgrade

E. Distribute the following words into nouns, adjectives and adverbs, then fill in each gap with the suitable word.

Benefit(2), simple, rapidly, generation, really, developers, quick, modular, capabilities

Noun	Adjective	Adverb

1. It was reported yesterday that a new _____ device had been designed.
2. ___ spite of being ___ it is _____.
3. Its ____ is that it has improved _____.
4. This device of a new _____ will be of great demand in a year or two.
5. It is _____ hard to believe.
6. However, the branch of the industry it was designed for is developing very _____ now.
7. That is why the _____ hope to get _____ from its commercial production.

Read the text and render it.

Text B

A Small World After All

In the past years a number of popular chipset and video card vendors have gone belly up. Diamond Multimedia was acquired by S3 (now SONICblue) and, while still in business, is out of the video card market.

3dfx, which once had a good share of the market with its Voodoo cards, bought STB, and then went under itself.

Matrox Graphics is still in business, as is ATI Technologies. Both of these are Canadian companies, with ATI having the greater share of the market. Right now, Matrox builds its own cards using only its own chipsets. ATI supplies many of the video chipsets used in laptops, but until recently reserved its RAGE and RADEON desktop chipsets for its own branded products. The company has recently announced
that it will start to supply video chipsets to other vendors, hoping to eat into some of Nvidia's popularity in the OEM market.

Nvidia doesn't actually produce video cards, only the chipsets for them. The very latest video chipset from this vendor is its GeForce3. At the moment, however, GeForce3 cards are hard to come by, and expensive when you can find them. The GeForce3 chipset builds on the GeForce2's hardware handling of transform and lighting (TAL) by providing programmable vertex shading and pixel shading. By allowing a Software developer to determine, from within the application, exactly how this will take place, the GeForce3 promises to deliver outstanding performance and even more realistic 3D graphics. In fact, Microsoft has selected the GeForce3 chipset to provide the graphics in its upcoming XBox game console.

UNIT 6

Grammar Module: The Gerundial Construction

Герундиальный оборот

Притяжательное местоимение или существительное в притяжательном или общем падеже в сочетании с герундием представляют собой герундиальный оборот. Герундиальный оборот на русский язык переводится придаточным предложением:

Their being invited to take part in that project was good fortune. –
То, что их пригласили принять участие в этом проекте, было большой удачей.

Exercises

I. Translate the following sentences beginning with the words *то, что …*
Model: Titanium having many advantages over other metals is certain. – То, что титан имеет большие преимущества по сравнению с другими металлами, несомненно.

1. Newton's having stated his laws of motion is very important for modern science.
2. Her studying a second foreign language shows that she is interested in getting a well-paid job in future. 3. His having made a series of experiments provided us with new data. 4. Their having signed the documents was known to us. 5. Our being invited to take part in such conferences is very important.

II. Define the functions of the gerund in the following sentences. Translate the sentences.

1. By placing an ultrasonic sensor at the top of the tank and using the liquid surface as a target, the user can easily determine the level in the tank.
2. Digital temperature sensors are similar to analog temperature sensors, but instead of outputting the data in current or voltage, it is converted into a digital format of 1's and 0's.
3. Traditionally personal computers have used the physics of magnetism as the primary means of storing programs and data for later use.

4. Setting the modulation frequency depends largely on the application requirements.
5. The laser has succeeded in cutting holes in diamonds.
6. Computers are machines capable of processing and outputting data.
7. Different ranges of bandwidth are necessary for different applications, and the mistake most consumers make is matching a certain application with a transport technology that does not best serve their particular need.
8. Choosing the best wire for the job is important, but there are realistic limits that can be achieved.
9. Before testing an unknown device, it is best to confirm and label lead polarity of your meter.
10. We've told about some of the initial power-line network offerings, and at 2MBps they are only worth considering if wireless Ethernet doesn't work in your environment.
11. Beyond this, additional testing will be needed requiring a service manual.
12. Various attempts at building optical computers over the next twenty years had, some small success, but the real advances had to wait for optical switches and semiconductor lasers.

III. There is a mistake in each of these sentences. Find it and correct it.

1. Floppy disks, hard disks, zip disks and backup tapes all work by magnetized small areas on the surface of the disk.
2. A wire that long is begging to conduct a static charge for the purpose to destroying S_3 or IC1 – possibly both at the same time.
3. Ultra-short waves passing through both layers in the sky ("Heaviside layer" and "Appletor layer") are useful for communicating with spaceships.
4. With so many ways of transport our data and video signals from point A to point B, potential customers are easily flummoxed over which method to buy.
5. The classic experiment floating a rare-earth magnet above a superconductor is pretty interesting.
6. Keep in mind that advertising a large diagonal CRT does not necessarily implying that you can fill it.
7. A robot should have had automatic means for controlling the limb from the memory.

8. The Greeks preferred build a slanting roof to a flat one because of the rainy weather in their country.
9. The new process involved replacing cubic Zirconia with magnesium oxide as the template material for the superconductivity film is being studied.
10. The separation of transistors and other circuit elements is accomplished by introducing rectifiers, which may allow current to flow in only one direction.

IV. Translate the following sentences from Russian into English using the appropriate form of the Gerund.

1. Такой эффект может быть достигнут путем подсоединения нескольких датчиков измерения температуры к цепи. 2. Группа исследователей работает над высокотехнологичным прибором для составления прогнозов о неблагоприятных природных условиях. 3. Люди покупают ноутбуки с мыслью, что будут использовать их не один год. 4. Многие люди стали использовать Интернет, чтобы общаться друг с другом. 5. Прежде чем включить прибор, внимательно прочтите инструкцию. 6. Существует много способов передачи сигнала с помощью света. 7. В то время, когда Алан Хонг стал думать об оптических компьютерах, лазерные и полупроводниковые чипы были еще относительно новыми разработками. 8. Ключевым преимуществом использования волокна в телефонии является его высокая пропускная способность. 9. Я интересуюсь проведением экспериментов с помощью лазерного луча. 10. Лазеры используются при создании голограмм. 11. Эти приборы нужно отремонтировать. 12. То, что мы получили отрицательный результат, очень огорчило нас. 13. Стоит ли проводить еще одно исследование?

Vocabulary

1. flatbed scanner – планшетный сканер
2. application – приложение
3. peripheral – периферийное устройство
4. array – матрица, решетка, сетка
5. to propel – двигать, продвигать, приводить в движение
6. stepper motor – шаговый двигатель
7. platen – пластина, плита

8. inch – дюйм
9. CCD – прибор с зарядовой связью; ПЗС

V. Warm – up

What are the basic principles of flatback scanners work?

VI. Reading

A. Read the text to check your answer.

Super Duper Scanners

Along with getting ever easier to use, each new generation of flatbed scanner gets better. Simple product design and the graphical nature of computer applications are two variables making a scanner a "must-have" peripheral.

All flatbed scanners work the same way, at least conceptually. A glass platen is used to position an original document facing towards the interior scan mechanism. This arrangement allows the scanning of a bound original, such as a page in a bock or magazine.

During the scan process, a beam of light is bounced off the document and reflected onto a sensing array. Depending on the construction of the scanner, there is either a mirror or a light source and/or sensor array mounted on the moving platform that is propelled by a stepper motor down the glass platen. Sensor elements may be either CCDs (Charge-Coupled Device) or CISs (Contact-Image Sensor), and the light source can be either cold- cathode fluorescent tubes or LEDs. The combination of a fluorescent light source and CCD sensor still provides the best color fidelity, while LED/CMOS-based scanners use less power and can be very thin units.

Scans are processed in the three primary colors (red, blue, and green) for each imaged pixel. The number of imaging sensors per inch in the scan array determines the horizontal imaging resolution, while the ability of the stepper motor to move the scan vertically in small increments determines the vertical resolution. The combination of those two factors is the scanner's actual optical resolution. Today's scanners range from 300 x 300 to 1200 x 2400 dpi in optical resolution. Increased resolution, helpful for scanning small objects (like 35mm slides) and making enlargements, uses a software technique *called interpolation*. This technique involves making an educated guess about the pixels that lie between imaging sensors, based on the color of the actual imaged pixels surrounding the unknown pixel.

Finally, in addition to the scanner's resolution, it's also important to consider the unit's color depth and interface. Color depth is a measure of how accurately a scanner can resolve color differences. At a minimum, a scanner will offer 24-bit color depth, which is actually 8 bits of data for each pixel for each of the primary color (red, blue, and green). Color resolution and accuracy are directly proportional.

B. Read the text again and complete this table with the most relevant information.

Technical specifications of the scanner work.

<table>
<tr><td>Common features</td><td colspan="2"></td></tr>
<tr><td rowspan="6">Peculiarities</td><td rowspan="2">1. Construction</td><td></td></tr>
<tr><td></td></tr>
<tr><td rowspan="2">2.Sensor elements</td><td></td></tr>
<tr><td></td></tr>
<tr><td rowspan="2">3. light source</td><td></td></tr>
<tr><td></td></tr>
</table>

C. Answer the questions.

1. How many primary colors are scans processed in? What are they?
2. What is the determining factor for the horizontal imaging resolution?
3. What determines the vertical resolution?
4. What is interpolation?
5. What does interpolation involve?
6. What is color depth?

D. Give Russian equivalents.

Sensing array, charge-coupled device, contact-image sensor, cold-cathode fluorescent tubes, color fidelity, stepper motor, color depth, interface.

E. Read these words paying attention to the stress. Make up sentences of your own with these words.

A position – to position
An access – to access
A face – to face
A range – to range
A measure – to measure
An interface – to interface

Text B
Computing with Light

a. For example, one could modulate the brightness (photons per second) of a beam of light, which would produce an amplitude-modulated signal (AM) for analog computing.

b. Since they are based on light-wave technology, optical computers can process information a million or more times faster than electronic computers.

c. However, because of light's wave-like properties, photons can do things that are impossible for typical particles – such as electrons.

d. Furthermore, multiple beams can converge on a single switching point with any combination of one or more beams triggering the switch.

e. We can create thousands or even millions controlled laser beams by splitting a single beam into as many beams as necessary.

A. Decide where paragraphs a to e fit in the gaps in the text. There's one extra paragraph which doesn't fit anywhere.

Squeezed light, holograms, and lasers sound like things you'd find in a science-fiction novel, but they can also be found in the labs around the world where they are used in the "thinking" machines of tomorrow – optical computers. 1_____ They are inherently parallel processors and almost completely immune to interference.

Optical computers use laser beams in place of wires. Unlike wires, laser beams can cross and intersect without affecting one another. 2_____ An electronic equivalent of such a multiple input switch is much more complex. Optical computers have all these advantages because of the fundamental nature of light.

Photons. Quantum theory tells us that light has the properties of both waves and particles. When discussing its particle nature, we call the particles "photons". 3_____ For example, thousands of photons can pass through a single point simultaneously without interfering with one another. Photons can also travel faster than electrons, which makes faster computational speeds possible.

As we'll discuss later on, light can also be used to represent information in many different ways. 4_____ AM signals can also be used to transmit binary data - you just need to define a brightness threshold to represent a one and another to represent a zero. Furthermore, we can frequency-modulate (FM) light. Changing the frequency is equivalent to changing its color. More advanced methods of light manipulation – like "spatial modulation" and holograms – will be discussed later. All these intriguing possibilities have been tempting scientists since the 1950's, but the technology to support them only began to appear during breakthrough research dating back to the eighties.

B. Find the sentences where gerund is used. Translate these sentences.

UNIT 7

Grammar: The Infinitive

Reading: Automation

Grammar: Инфинитив (The Infinitive)

Инфинитив является неличной формой глагола, которая выражает действие без указания лица и числа и соответственно не может выполнять в предложении функцию сказуемого.

Формы инфинитива

	Active	Passive
Indefinite (Simple)	To write	To be written
Continuous	To be writing	-
Perfect	To have written	To have been written
Perfect Continuous	To have been writing	-

Будучи неличной формой, инфинитив сочетает в себе свойства глагола и существительного.
Глагольными свойствами инфинитива являются следующие:

1. Категория относительного времени (т.е. по отношению к моменту совершения действия, выраженного глаголом-сказуемым)
Неперфектные формы выражают действия, одновременные или будущие по отношению к глаголу-сказуемому.

They are glad to participate in the research.

Перфектные формы выражают действия, предшествующие действию, выраженному глаголом-сказуемым.

They are glad to have participated in the research.

2. Категория залога. Имеет формы действительного и страдательного залогов.

They are to discuss the joint project on space research at the next conference.

The joint project to be discussed at the conference is of great importance for their research.

3. Имеет прямое дополнение.

To translate the article without a dictionary was difficult.

4. Определяется наречием.

We asked him to speak slowly.

Свойства существительного, которыми обладает инфинитив, определяют его синтаксические функции в предложении. Инфинитив выполняет в предложении функции подлежащего, части составного сказуемого, дополнения, определения, обстоятельства.

Функции инфинитива в предложении

I. Подлежащее (The Subject) Переводится инфинитивом или существительным	To link theory with practice is of great importance. – Связь теории с практикой чрезвычайно важна. It was quite necessary to realize the idea. – Было совершенно необходимо осуществить идею.
II. Часть составного сказуемого. (The part of the compound predicate). Переводится инфинитивом (глагол-связка переводится словами *состоять* (заключаться) *в том чтобы, словом это,* в настоящем времени может не переводиться.) 1. Именная часть составного именного сказуемого (the predicative) 2. Часть составного глагольного сказуемого (the verbal predicate). Инфинитив употребляется после модального глагола или его эквивалента, или глаголов, обозначающих начало, продолжительность, окончание действия (to begin, to continue, to finish)	1. His duty is to register the results of experiments. – Его обязанность (заключается в том, чтобы) регистрировать результаты экспериментов. 2. They had to improve the device to obtain more accurate data. – Они были вынуждены усовершенствовать прибор, чтобы получить более точные данные. He began to conduct the experiment last week. – Он начал проводить эксперимент на прошлой неделе.
III. Дополнение (The Object) Переводится инфинитивом, существительным.	He tried to use this device in his work. – Он попытался использовать устройство в своей работе.
IV. Определение (The Attribute). Инфинитив в функции определения (после определяемого существительного) может переводиться различными способами. 1. Инфинитивом (существительным). 2. Личной формой глагола в определительном придаточном предложении,	1. Attemps to build this machine were made at the end of the last century. – Попытки построить эту машину предпринимались в конце прошлого века. It is not the right time to discuss the question. – Сейчас не совсем подходящее время обсуждать этот вопрос.

сказуемым, которое выражает действие, которое совершится, должно или может совершиться. 3. Личной формой глагола в том же времени, что и глагол-связка после слов: the first, the second, the last и т.д.	2. The article to be discussed tomorrow is written by our professor. – Статья, которая будет (должна) обсуждаться завтра, написана нашим профессором. The project to realize was rather complicated. – Проект, который необходимо было осуществить, был достаточно сложным. He is the man to be relied upon (who can be relied upon). – Он – человек, на которого можно положиться. 3. He was the first to apply this new method of work. – Он первым применил этот новый метод работы. Our question will be the first to be discussed. – Наш вопрос будет обсуждаться первым.
V. Обстоятельство (The Adverbial Modifier) 1. Обстоятельство цели (The A.M. of purpose). Переводится инфинитивом с союзами *чтобы, для того чтобы* или без союзов. 2. Обстоятельство следствия (The A.M. of result). Инфинитиву предшествуют слова *too, enough;* переводится инфинитивом с союзами *чтобы, для того чтобы*	1. To study the properties of the substance they made a series of experiments. – Для того, чтобы изучить свойства вещества, они провели ряд экспериментов. It was necessary to install special equipment to realize the idea. – Было необходимо установить специальное оборудование, чтобы реализовать идею. 2. He was too tired to continue the work. – Он слишком устал, чтобы продолжить работу. The method is not accurate enough to give reliable results. – Этот метод недостаточно точен, чтобы дать надежные результаты.

I. Translate the sentences. Define the form and the function of the Infinitive.

1. To predict the existence of an unknown phenomenon or object has always been considered a topmost achievement for the theory.
2. Ring sections of the reactor are then welded together to form a complete sphere.
3. To carry out the task they had to work for three hours.

4. A new concept is required to explain all the observed phenomena.
5. The emitted radiation can be detected by various means such as photographic films.
6. The classical laws of mechanics and electricity fail to predict the behaviour of atoms.
7. To imagine modern science without optical instruments is absolutely impossible.
8. The main advantage of this principle lies in its ability to allow one of the major obstacles to be avoided.
9. It is impossible to solve many important economic problems without searching for new sources of energy.
10. One line can be used to send many messages at the same time if each message is sent out at a different frequency.
11. To communicate information of some sort must be transferred.
12. Scientists all over the world were quick to realize the importance of radio and contributed much to its further development.
13. Specialists face many technical problems to be solved in the field of communication.
14. The term “integrated circuit” is used to describe a group of electronic elements connected together by a variety of circuit assembly techniques to perform a given electronic function.
15. The aim of the machine designer is to predict accurately the performance of the machine he intends to build. To do so he must know the theory of operation and must be able numerically to evaluate the theory.
16. To have been recognized as a talented designer gave him great satisfaction.
17. We have tested the machine to be put into operation tomorrow.
18. Linear feedback control systems have now reached such a state of perfection that the design of a system to meet any set of performance is a fairly simple matter.
19. To judge the intensity of sound for comparative test purposes is more difficult although it can be conceded that skilful operators are able to do this satisfactorily.
20. Professor Babbage was the first to conceive the idea of a computing machine.
21. To solve the problem they decided to make use of the helium-neon laser beam penetrating power.

22. Experience had shown that the best way to send a weak radio signal from and through space is to use a signaling method known as pulse-code modulation.
23. At low frequencies the carrier wave has too slow a rise to be of any use.
24. To strengthen the magnetic field means to increase the acceleration of the particles.
25. They were glad to have been invited to participate in this famous scientist's research.
26. It was found that the forward resistance of diodes is too variable to use the diode in place of a relay.
27. I am delighted to be discussing this important question with you now.
28. Man's mind interprets vital data too slowly to keep track of many modern weapons and vehicles. The electronics steps in to react, to interpret, to compute, to control, and finally to take the place of man's senses and mind.
29. There are many variations which may be applied to compensate for the leakage of the rectifiers and to control feedback effects.
30. To be effective such controls must extend through all processes of manufacture from the raw material to the final deposition of the component in the finished equipment.

II. Match up the English and Russian sentences paying attention to the form of the Infinitive.

I am glad to visit you. –	Я рад, что посещаю вас.
to have visited you –	что вы посещаете меня
to be visited by you –	посетить вас
to be visiting you –	что посещаю вас уже некоторое время
to have been visited by you –	что посещаю вас постоянно
to have been visiting you –	что вы посетили меня

III. Choose the correct translation of the Russian sentence.

1. Я доволен, что принял участие в обсуждении этого проекта.	a) I am glad to take part in in the discussion of this project.

	b) I am glad to be taking part in the discussion of this project c) I am glad to have taken part in the discussion of this project.
2. Кажется, они заканчивают свое исследование.	a) They seem to finish their investigation. b) They seem to be finishing their investigation. c) They seem to have finished their investigation.
3. Он не любит, когда его беспокоят во время работы.	a) He doesn't like to be disurbed during his work. b) He doesn't like to disturb people during their work.
4. Я хочу, чтобы мне помогли.	a) I want to help you. b) I want to be helped.
5. Для того, чтобы быть опубликованной в английском журнале, статья должна быть переведена на английский язык.	a) To be published in an English journal the article must be translated into English. b) In order to publish an article in an English journal, it is necessary to translate it into English.

IV. Replace the subordinate clauses by the Infinitives.

Example:

1. The problem which will be discussed is very important. The problem to be discussed is very important.

2. The text is so short that it can be translated in an hour. The text is short enough to be translated in an hour.

1. This is an interesting fact which you can mention in your speech.
2. I am going to tell her about the problem which will be discussed at our meeting.
3. He was the only one who knew the answer.
4. There was nothing that could attract our attention.

5. There is no one who could explain it better than you.
6. That engine was the last which was repaired.
7. You are so experienced, you ought to know better.
8. His English vocabulary is very poor, he can't make himself understood.
9. She knows English so well that she can read English writers in the original.
10. If you want to do the work well you must be very careful.
11. If we are to get to their place in time we should take a taxi.

V. Translate the sentences into English.

1. В этой области науки есть много вопросов, на которые необходимо дать ответы.
2. Цель нашей работы заключается в том, чтобы получить необходимые данные.
3. Продолжать обсуждение вопроса было неразумно.
4. Очень любезно с вашей стороны, что вы принесли книгу, которая мне необходима.
5. Он первым предложил мне свою помощь.
6. Она уезжает на конференцию, которая будет проводиться в Москве.
7. Цель заключается не только в определении проблемы, но также в ее решении.
8. Он достаточно умен, чтобы не сделать такую ошибку.
9. Она не знала, какую тему выбрать для доклада.
10. Мне пришлось еще раз выходить из дома, так как я забыл отправить письмо.
11. Ему не нравилось, что ему указывают, что делать.
12. Вы единственный человек, кто может справиться с такой задачей.
13. Вы не помните, кто первый сообщил эту новость?
14. Чтобы найти необходимые данные, им пришлось просмотреть большое количество научных изданий.
15. Мы не знали, как связаться с ним, чтобы уточнить тему его исследования.
16. Он не ожидал, что ему предложат эту должность.
17. Было очень трудно убедить их принять наши условия.
18. Задача слишком сложна, чтобы возможно было так легко решить ее.

19. Я удивилась, что меня узнали через столько лет.
20. Сожалеем, что заставили вас так долго ждать.
21. Чтобы эксперимент был успешен, необходимо использовать самое современное оборудование.

Reading. **Automation**

I. Read and memorize the following words.

1. enormous – громадный, огромный
2. impact – импульс, влияние, воздействие
3. take for granted – считать (что-либо) доказанным (не требующим доказательств, само собой разумеющимся)
4. otherwise – иначе, иным способом, образом
5. regard – рассматривать, считать
6. date back – датироваться, относиться к определенному времени, восходить к определенной эпохе
7. advent – приход, появление
8. linkage – соединение, сцепление, связь, передача, механизм передачи
9. typify – быть типичным представителем, служить типичным примером или образцом; символизировать, олицетворять
10. centrifugal governor – центробежный регулятор
11. cumbersome – тяжелый, громоздкий
12. extend – расширять, удлинять, увеличивать
13. field winding – обмотка возбуждения
14. rolling – прокатка
15. paper mill – бумажная фабрика
16. traction – тяга, тяговое усилие
17. thermionic valve – лампа с термокатодом
18. fragile – хрупкий, ломкий, слабый, непрочный
19. hitherto – до настоящего времени, до сих пор
20. trouble-free operation – надежное, безотказное действие
21. obvious –явный, очевидный, ясный
22. tedious – скучный, утомительный
23. congenial – 1) близкий, родственный 2) подходящий, благоприятный
24. inconceivable – непостижимый, непонятный, немыслимый
25. precision – точность
26. repeatability – повторяемость, воспроизводимость
27. assessment – оценка, мнение, суждение

28. throughput – пропускная способность, производительность
29. justify – оправдывать, подтверждать
30. premium – награда, вознаграждение, надбавка
31. quantify – определять количество
32. reclaim – исправлять, совершенствовать; восстанавливать

II. Analyze the following derivatives. Translate them and find their roots.

Linkage, application, various, reliability, inconceivable, elimination, repeatability, subjective, assessment, dangerous, consideration.

III. Define if the following pairs of words are synonyms or antonyms. Translate the words.

Enormous-tremendous; to regard–to consider; advantage-disadvantage; impact-influence; contemporary-modern; available-unavailable; to eliminate-to include; bulky-cumbersome; application-use; to enable-to allow; difficult-easy; obvious-evident; to reduce-to increase; tedious-dull; possible-impossible; to assist-to help; precision-inaccuracy

IV. Give the Russian equivalents of the following word combinations and terms. Do they have any relation to the sphere of automation? What is your opinion?

A mechanical control system; a d.c. electric motor; a steam engine; control current; a conveyor drive; an integrated circuit; a low-cost computer; production specification; feedback of information; reduced waste

V. People always try to use their knowledge for their benefit to improve and facilitate living conditions. Nowadays our life can't be imagined without automation. Read the text and state why an impact of automation on modern society is so enormous.

Text A.

History of Automation.

Automation has had an enormous economic, political, and social impact on modern society. Indeed, it is difficult to see how so much that we take for granted today would otherwise be possible.

Although automation is commonly regarded as a contemporary development the use of mechanical techniques to reduce or eliminate the labour required in labour – intensive processes dates back over a long period.

The advent of the Industrial Revolution resulted in the development of complex mechanical linkages and mechanical control systems typified by the centrifugal governor to regulate the speed of steam engines, however, the relatively bulky and cumbersome nature of mechanical control systems limited their application. Electrical machinery developed in the latter part of the 19-th century further extended applications of automation in industry. The ability to control the speed and power of a d.c. electric motor by a relatively small control current in the field winding enabled automatic feedback systems of various kinds to be developed for application in rolling and paper mills, conveyor drives and traction.

The application of the thermionic valve in the 1920s and the effects of World War II resulted in further developments although the high cost, relatively fragile nature and the need for skilled servicing of electronic equipment limited applications to large-scale processes where the advantages were considerable. A few early applications of computers using thermionic valves were developed in the 1950s in such areas as the steel, chemical and electrical supply industries.

The impact of the semiconductor followed by the integrated circuit has had an enormous effect on the growth of automation. Previously where automation may hitherto have been possible at a high cost and relatively low reliability, for the first time low-cost control systems capable of trouble-free operation in the industrial environment are now available. The full extent of this revolution has yet to be seen. The advent of low-cost computers capable of adaptive control of complete processes is likely to have a marked impact on industry in the future.

The advantages of automation are considerable. The most obvious advantage is the reduction of the labour required. The benefits of automation have resulted in bigger markets, new and better jobs together with better working conditions. The labour released from work which may have been tedious and repetitive has been used for more congenial and fulfilling work.

Automation has enabled technical advances in processes possible. The operation today of a chemical plant, power station, steel works or car factory is inconceivable without an advanced degree of automation. The elimination of human error is another important advantage enabling greater precision, repeatability and safety to be achieved. Subjective assessment and tedious and dangerous jobs can be eliminated. Automation may often be used to assist in labour-intensive processes to obtain improved product quality and increase throughput.

Automation may be justified on social, environmental or economic considerations. Such factors as an improved product enabling a premium price to be obtained, reduced waste-due to closer production specification, ability to quantify factors which was not previously possible enabling savings to be made, e.g., stock control and feedback of information during processing enabling waste to be reclaimed, are some of the obvious benefits of automation.

VI. Say in what connection the following phrases are used. Give their Russian equivalents.

Labour-intensive processes; mechanical linkages; electrical machinery; automatic feedback systems; large-scale processes; trouble-free operation; adaptive control of complete processes; congenial and fulfilling work; an advanced degree of automation; to obtain improved product quality and increase throughput; the obvious benefits of automation.

VII. Arrange the sentences according to the logic of the text.

1. The benefits of automation have resulted in bigger markets, new and better jobs together with better working conditions.
2. The impact of the semiconductor followed by the integrated circuit has had an enormous effect on the growth of automation.
3. The use of mechanical techniques to improve labour conditions dates back over a long period.
4. The operation today of a chemical plant, power station steel works or car factory is inconceivable without an advanced degree of automation.
5. Electrical machinery developed in the latter part of the 19th century further extended applications of automation in industry.
6. A few early applications of computers using thermionic valves were developed in the 1950s.
7. The advent of the Industrial Revolution resulted in the development of complex mechanical linkages and mechanical control systems but their application was limited.

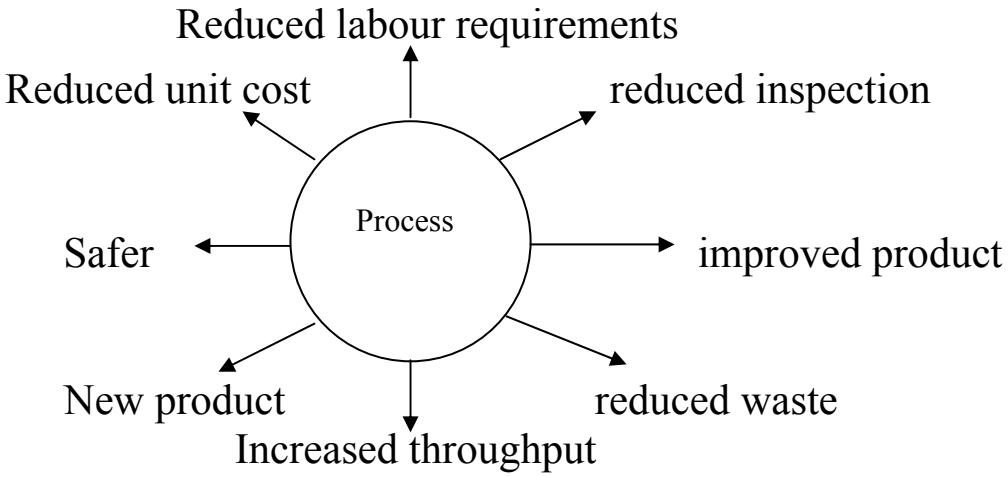
VIII. Agree or disagree with the following statements. Correct the wrong statements.

1. The impact of automation on modern society is insignificant. All modern achievements would be possible without automation.

2. Automation refers only to the developments of recent years.
3. The first step in the application of automation in industry was taken with the advent of the Industrial Revolution when mechanical control systems were created.
4. Electronic equipment based on thermionic valves could have only limited applications because of serious drawbacks.
5. The semiconductor followed by the integrated circuit gave a great impact to the growth of automation and this impact on industry will increase in the future.
6. It is difficult to justify automation from the point of view of social, environmental and economic considerations because the advantages of automation are not so considerable as might be expected.

IX. Divide the text into logical parts, state the key idea and suggest a title for each part. Write an outline of the text.

X. Discuss the advantages of automation using the following scheme.



Some advantages that can be obtained from automation.

Text B.
Linear Control Systems

I. Look through the list of the words for better understanding of the text.

Encompass – заключать (в себе), касаться
Actuator – силовой привод; воздействующее устройство; исполнительный механизм; датчик
Motorized valve – клапан с приводом от мотора
Setting – установка; регулирование, настройка

Operative in charge –	зд. работающий, действующий процесс (загруженный в данный момент)
Fluctuation –	колебание, неустойчивость
Set point –	заданное значение регулируемой величины
Reference signal –	опорный сигнал
Disastrous –	бедственный, гибельный; катастрофический
Back-lash –	мертвый ход, зазор, люфт
Dead space –	мертвая зона, зона нечувствительности
Hunting –	свободное искание; нерегулярные колебания (в следящей системе); перерегулирование

II. Skim through the text and answer:

1. What systems are described?
2. What types of these systems are mentioned?
3. What are the spheres of application of such systems?

Linear Control Systems

Control systems are used in all areas of industry. The process may encompass almost any conceivable operation ranging from operation of a machine tool to filling bottles. The components comprising a simple control system can be categorized as controller, final actuator or servo, the process and the sensor. The components vary depending on the process. The process parameters are varied by the final actuator. The final actuator may be controlled in turn by a secondary actuator, e.g., the speed of a hydraulic drive may be increased with a motorized valve. The control setting may be varied with the controller which may be mechanical, electromechanical, hydraulic or electronic. The setting of the controller is fixed by the operative in charge of the process.

Such a system is known as an open-loop system and is illustrated schematically in Figure 1 (a). The sensor indicates the state of the process. Open-loop systems are used in all areas of industry where fluctuations in the process variables occur within acceptable limits or occur slowly and can be corrected by adjusting the set point by the operator. If now a feedback signal is obtained from the sensor this can be used to maintain the process within set limits. The feedback path is shown in Figure 1 (b). This now becomes a closed-loop control system and is known as a servomechanism. The action of the controller is now to compare a reference signal corresponding to the set point with the feedback signal, the difference being the error signal E. This is normally amplified and used to restore the process to the set point.

In any closed-loop control system a high degree of precision in terms of the error ratio is required. One factor that limits this is the system stability which decreases as the amplitude ratio is increased. If a system becomes unstable it goes out of control which may have disastrous effects.

For any control system there is a small region either side of the set point over which no control action occurs. This may be due to mechanical back-lash, thermal inertia, etc: if the dead space is made very small instability may occur. This is known as hunting and occurs where the control element is in effect oscillating about the set point which can give rise to instability and is an important consideration in the design of precision control systems.

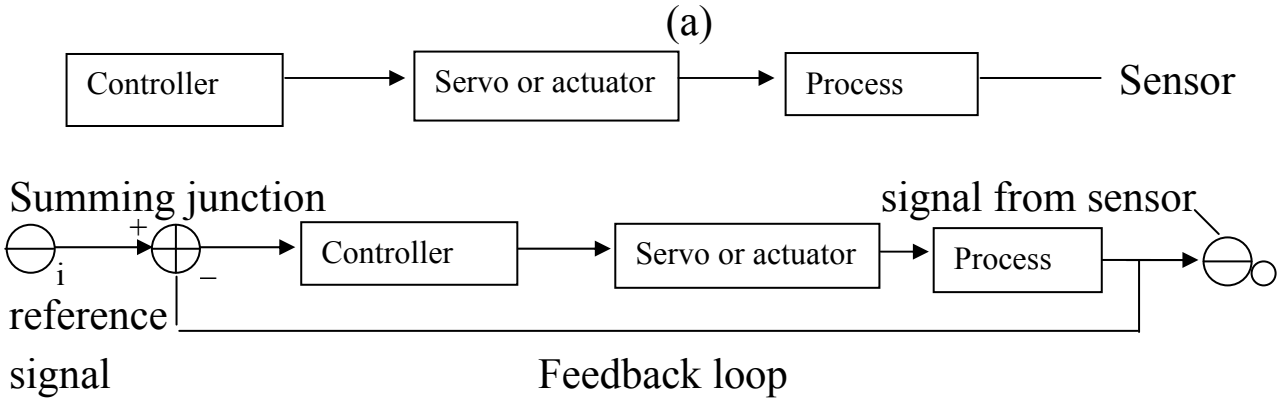


Figure 1. Basic components of a control system (a) open loop (b) closed loop.

III. Read the text again more carefully. Describe the structure of an open-loop system and a closed-loop system using Figure 1. What factor does the number of components depend on?

IV. Compare the two systems. Is there any difference between them? What aspects are different?

V. Explain what hunting is and why it should be taken into consideration in the design of precision control systems.

Text C.
Cybernetics.

I. Translate the text in writing. Indicate the radioengineering terms.

Cybernetics tends to be popularly associated with the interaction of man and machines. One of the first conscious applications of cybernetics was in the interaction of the human operator with anti-aircraft artillery in

World War II. The development of automata (robots) has also been intimately associated with cybernetics including machines such as the haemostat which simulates the adaptive conditions of living organisms.

The term cybernetics was originally coined by Wiener from a Greek word meaning steersman to encompass an interdisciplinary field "Centring about communication, control and statistical mechanics whether in machine or living tissue".

Up to now the application of control theory in terms of technical processes has been considered. Most of the examples have been well defined closed-loop problems however many apparently open-loop systems can be considered as closed if we take into account other self-limiting factors. An example is the temperature control of an electric oven without a thermostat. This is controlled by the heat losses which are in turn governed by ambient conditions. The control loop is therefore completed by an external feedback loop although it may be difficult to determine the transfer functions of elements in the system. Alternatively, the loop may be closed by an operator who turns off the power source when the required temperature is reached and turns it back on at a lower temperature. If the power is left on continuously the temperature eventually reaches a maximum value. The application of the principles of control theory is however still applicable. Cybernetics is the term used to encompass the broad application of control principles in the broadest sense.

More general examples of cybernetic systems are the interaction of man and machine, a society or section of a society, the interaction between nations, defense strategies, economic systems and biological behaviour. The control and automation of processes is simply a narrow (but important) facet of the broad field of cybernetics. Often the principal difficulty in cybernetic systems is the problem of describing the system performance. Unlike the complex control systems which can be broken down into a series of individual control loops which, if a sufficiently large computer were available could be precisely analysed – a cybernetic system may consist of numerous interrelated systems and feedback loops some of which may not even be known to be present.

In many cases since the transfer function of the components of the system loop may not be accurately known it is necessary to use statistical theory, probability and other information –processing techniques. The feedback loop in animals or humans can be provided by communication and the techniques of communication theory may also be involved.

UNIT 8

Grammar: The Infinitive Constructions
Reading: Robots
Grammar: Инфинитивные обороты

В английском языке распространены сложные члены предложения с инфинитивом, которые обычно переводятся придаточными предложениями.

1. Сложное дополнение или объектный инфинитивный оборот (Complex Object или Objective Case + Infinitive), соответствующее английскому дополнительному придаточному предложению.
2. Сложное подлежащее или субъектный инфинитивный оборот (Complex Subject или The Nominative with Infinitive), соответствующее английскому подлежащному придаточному предложению.
3. Инфинитивный оборот с предлогом for (For +Objective+ Infinitive), соответствующий различным придаточным предложениям.

Сложное дополнение (Complex Object)

Конструкция представляет собой сочетание существительного в общем падеже или местоимения в объектном падеже с инфинитивом и является эквивалентом дополнительного придаточного предложения. На русский язык конструкция переводится дополнительным придаточным предложением, вводимым союзами *что, чтобы, когда, как.* Существительное или местоимение в сложном дополнении соответствуют подлежащему, а инфинитив – сказуемому этого придаточного предложения.

Конструкция употребляется после глаголов, выражающих:

1. Желание и потребность: to want, to wish, to desire, to like, would like.

We would like him to take part in the conference. – Нам хотелось бы, чтобы он принял участие в конференции.

They wanted the device to be examined carefully by experts. – Они хотели, чтобы устройство было тщательно обследовано экспертами.

2. Физическое восприятие и ощущение: to see, to watch, to notice, to observe, to feel, to hear. После этих глаголов частица **to перед инфинитивом в сложном дополнении опускается.**

I heard somebody speak in the next room. – Я слышал, как кто-то разговаривал в соседней комнате.

Nobody noticed him leave the room. – Никто не заметил, как он вышел из комнаты.

3. Приказание, побуждение, разрешение, просьбу: to order, to allow, to let, to cause=to force=to make –заставлять. После глаголов to make (заставлять) и to let (позволять) инфинитив в сложном дополнении **употребляется без частицы to.**

The director ordered these documents to be sent off at once. – Директор приказал, чтобы эти документы были отправлены немедленно.

The teacher made the students rewrite the exercise. – Преподаватель заставил студентов переписать упражнение.

4. Процесс умственной деятельности: предположение – to expect, to suppose, to believe, to consider; знание, осведомленность, утверждение- to know, to think, to state, to note, to report.

We believe him (believed)
- to finish this work tomorrow.
- to be finishing this work now.
- to have finished this work.
- to be sent to the conference.
- to have been sent to the conference as our representative.

Мы полагаем, что (полагали)
- он закончит работу завтра.
- заканчивает сейчас работу.
- закончил работу.
- его пошлют на конференцию.
- послали на эту конференцию в качестве нашего представителя.

Notes: 1) После глагола *to help* инфинитив в сложном дополнении может употребляться как с частицей to, так и без нее.

Help me to do it. Help me do it.

2) Следует обратить внимание на значение глаголов **to let, to make, to have** в сочетании со сложным дополнением: let smb do smth – позволить; make smb do smth – заставить; have smb do smth – распорядиться, чтобы…

I let them use dictionaries. – Я разрешаю им пользоваться словарями.

I had them use dictionaries. – Я распорядился, чтобы они пользовались словарями.

I made them use dictionaries. – Я заставил их пользоваться словарями

Сложное подлежащее (Complex Subject)

Конструкция представляет собой сочетание существительного в общем падеже или местоимения в именительном падеже с инфинитивом, следующим за сказуемым и является эквивалентом подлежащего придаточного предложения. Complex Subject переводится на русский язык дополнительным придаточным предложением, присоединяемым союзами *что, чтобы, когда, как* к главному безличному или неопределенно-личному предложению, соответствующему глаголу-сказуемому английского предложения. Предложения со сложным подлежащим можно переводить простым предложением, в котором имеется вводное предложение (как говорят, как ожидают, как сообщалось), соответствующее сказуемому английского предложения.

Сложное подлежащее употребляется:

1. При сказуемом в страдательном залоге глаголов, выражающих:

а) знание, осведомленность, утверждение: to know, to think, to state, to report

б) предположение: to expect, to suppose, to believe, to consider

с) восприятие: to see, to observe, to hear

Heat was thought to be a material substance. – Полагали, что тепло является материальной субстанцией.

Radio is known to have been invented in Russia – Известно, что радио было изобретено в России (Радио, как известно, было изобретено в России)

2. При сказуемом в действительном залоге, выраженном глаголами:

to seem, to appear- казаться, по-видимому, to prove, to turn out – оказаться; to happen, to chance – случаться, случайно

He proved to be a good designer. – Он оказался хорошим конструктором.

The house seems to have been damaged by the earthquake – Этот дом был, по-видимому, поврежден землетрясением.

3. При именном составном сказуемом:

is likely –	вероятно
is sure –	несомненно
is certain –	безусловно, непременно
is bound –	наверно
is unlikely –	маловероятно, вряд ли.
is apt – is liable –	вероятно

These difficulties are likely to arise in carrying out this experiment. – Эти сложности, вероятно, возникнут при проведении эксперимента.

He is unlikely to have made such a mistake. – Маловероятно, что он сделал такую ошибку.

Инфинитивный оборот с предлогом For

Конструкция состоит из предлога For, существительного в общем падеже или местоимения в объектном падеже и инфинитива, который выражает действие, производимое данным лицом или предметом. Такой оборот представляет собой любой сложный член предложения (подлежащее, дополнение, определение, обстоятельство), который переводится придаточным предложением (иногда инфинитивом).

1. Подлежащее. It is (was, will be) important (easy, good, necessary, impossible) for somebody to do (to be doing) something, (for something to be done)

It is important for us to finish the experiment in time. – Нам важно закончить эксперимент вовремя.

2. Дополнение.

Nearly a month is required for the Moon to circle the Earth. – Почти месяц необходим луне, чтобы совершить оборот вокруг земли.

I am anxious for you to succeed. – Я очень хочу, чтобы вы добились успеха.

3. Определение.

It is not the right time for us to speak about it. – Сейчас не время нам об этом говорить.

4. Обстоятельство.

a) цели

For this phenomenon to be explained we must get some new information. – Для того, чтобы объяснить это явление, мы должны получить некоторую новую информацию.

b) следствия

The article is too difficult for us to translate it without a dictionary. – Статья слишком сложна, чтобы мы перевели ее без словаря.

I. Translate the sentences. Point out Complex Object.

1. Radio allows us to communicate with the remotest corners of the world.
2. We know the electric current to flow in metal parts.
3. The engineer wants the new devices to be tested in the laboratory.
4. The operator considered the amplifier to be powerful enough for the given operation.
5. We expect the latest developments in this field of science to stimulate experiments on a more professional level.
6. One can make an automatic computer carry out any calculations that can be performed by a human operator.
7. The high electron energy in the helium discharge causes many helium atoms to be excited.
8. The results obtained do not permit any conclusions to be drawn.
9. These properties enable the solution of equation to be carried out with great accuracy.
10. The use of the device eliminates the mains transformer and allows the receiver to be used on either AC or DC circuits without change.
11. This combination of electric and magnetic fields causes the electrons emitted from the cathode to move in nearly circular paths in the region between cathode and anode.
12. They have seen the device begin to operate.
13. We heard the scientist explain the process of amplifying signals.
14. The simplified characteristic assumes both transistors to have identical characteristics and that each transistor acts as a two terminal device.

II. Translate the sentences paying attention to Complex Subject Give all possible ways of translating the construction.

1. The result is expected to agree with theoretical predictions.

2. The numerical method suggested in this paper does not seem to apply to all possible cases.
3. A variety of dark clouds and infrared objects are reported to have been discovered and classified.
4. Electronics is sure to give the space pilots easy control for soft landing on other planets.
5. The human voice is known to contain higher frequencies.
6. Very satisfactory communication is sure to be achieved over a telephone channel with frequencies up to 4,000 Hz.
7. These values are known to be in agreement with those obtained by the conventional methods.
8. Other abundant sources of energy awaiting development are known to be solar radiation , the earth's heat , and the fusion of light nuclei.
9. Further design improvements are likely to increase the device reliability appreciably.
10. A length of 25,5 inches was found to give a resistance of 40 ohms.
11. The model turned out to have approximately the right density.
12. This low level amplifier has proven to be one of the most popular of the various magnetic amplifier models.
13. Improvements in the methods of manufacturing the capacitors from the commercially available materials have resulted in capacitors that are expected to give continuous operation over long periods with few failures.
14. The great speed, accuracy, and adaptability of the most modern computing machines are known to have led to their application in various fields of science and technology.
15. As new transistors and related semiconductor devices are developed and improved, the possible fields of application for these devices increase to such an extent that they may truly be said to have revolutionized electronics.
16. There appears to be two methods of avoiding such difficulties.

III. Change the following complex sentences into simple sentences with Complex Subject.

Example: It is known that this scientist has made an important discovery.

This scientist is known **to have made** an important discovery.

1. It is known that the sound from the telephone is transmitted over long distances.

2. It seems that they have invented a new device.
3. It is likely that the history of a telephone is known to the students.
4. It is believed that the new method has given good results.
5. It is expected that new telephone services will appear in future.
6. It is known that sound travels through the air in waves.
7. It is believed that the average reliability of electronic systems is about 6,000 hours per circuit failure.
8. It seems certain that the detector should possess excellent amplitude linearity.
9. It appears that these approximations are accurate enough for most practical design details.

IV. Select the sentences containing Complex Subject. Translate the selected sentences.

1. The theory is known to everybody. 2. Good answers are expected from the students. 3. He is expected to give a good answer. 4. The 4,000 –ohm resistors are regarded to be quite satisfactory. 5. It is likely that the research will be finished soon. 6. It seems that these devices have excellent performance. 7. Underwater television has proved to be an important aspect of TV. 8. The news is reported in all newspapers. 9. The news is reported to be very important. 10. The discovery is likely to have been made by a group of scientists.

V. Translate the sentences paying attention to different functions of «for-phrases» with the infinitive.

1. It is usual for any new device to be preceded by other related devices.
2. It is seen that the noise power is nearly exponential with bias, but there is some tendency for the noise power to deviate from exponential in the same general way in each sample at the lower bias values.
3. Before the advent of the electronic computer it was by no means uncommon for the complete analysis of a single molecule to take two or three years.
4. The frequency of transmission was low enough for reflection to take place from those areas of the ionosphere illuminated by the sun.
5. It is necessary for the signal –to – noise ratio to be as optimal as possible.
6. This current will have to be of such a magnitude as to cause the magnetic material to experience the changes in flux level which are required for it to absorb voltage.

7. It is necessary for the design feedback control system to be checked experimentally.
8. The results were not satisfactory enough for a gap in the record to be adequately filled.
9. For the current to flow in the circuit we must apply a positive charge to the plate.
10. For the whole system to function automatically we are to use some electronic equipment.
11. It is possible for vacuum tubes to convert part of their energy into visible light.

VI. Put the particle «to» where necessary before the infinitives.

1. The teacher made me … repeat it all over again. 2. You needn't … ask for permission, I let you … take my books whenever you like. 3. You seem … know this question very well. 4. He told me … try … do it once again. 5. I felt this … be true. 6. He was heard … mention your name several times. 7. They are expected … arrive in a few days. 8. What makes you … think so? 9. There was nothing for him … do but … wait. 10. We consider the experiment … have been made already. 11. We heard the door … close after him. 12. You can't make me … say what you want me … say.

VII. Use the appropriate form of the infinitives in brackets and translate the sentences.

1. He is a talented engineer. He is supposed (to work) at a new invention.
2. She seems (to work) at her course paper since spring and says she has still a lot (to do).
3. You needn't (to mention) it again. He is unlikely (to forget) it.
4. I am quite happy (to travel) all over the world during my last summer holidays.
5. He is believed (to teach) by his father.
6. The students were glad (to invite) to this conference.
7. This work must (to complete) as soon as possible.
8. The design seems (to improve) already.
9. We have some problems (to discuss) at our meeting.
10. The students heard their professor (to deliver) his lecture in English.
11. We suppose them (to develop) this system for some time already.
12. The secret was believed (to lose).
13. We watched the temperature (to rise) gradually.

14. She was seen (to wait) in the office.
15. Many scientists are known (to study) this theory for a long time.
16. I saw the teacher (to enter) the classroom already.
17. The failure of the experiment seems scarcely possible (to explain).

Reading Robots

I. Read and memorize the following words.

1. numerous – многочисленный
2. attempt n. – попытка
3. to coin – создавать новые слова , выражения
4. steam engine – паровой двигатель
5. gadget – (новое) приспособление или устройство; техническая новинка
6. wrist – запястье
7. gripper – захват, зажим; захватное устройство; клещи
8. essential – необходимый; существенный, существенно важный
9. to grasp – схватывать, захватывать; за(с-)жимать
10. to position – ставить, помещать, устанавливать в определенном положении
11. adaptive – приспособляющийся, адаптивный
12. to forge – ковать
13. foundry work – литейная работа
14. loading – погрузка
15. rigid – жесткий, устойчивый; фиксированный
16. to possess – обладать, владеть
17. tactile – осязательный
18. magnitude – величина; размеры
19. subsequently – впоследствии, затем, потом
20. to appraise – оценивать
21. purposeful – целеустремленный, целенаправленный
22. therefore – по этой причине, поэтому, следовательно
23. to consider – рассматривать, полагать, считать
24. to exclude – исключать
25. substitute n. – замена

II. Analyze the following derivatives. Translate them and find their roots.

development, invention, appearance, basically, mechanical, movement, automatically, industrial, intellectual, difference, unloading, reaction, decision, practically, helpful, scientific, prevention, productivity.

III. Translate the words formed by conversion. Use some of them in your own sentences.

attempt – to attempt; cause – to cause; change – to change; machine – to machine; store – to store; approach – to approach; grip – to grip; process – to process; load – to load; substitute – to substitute.

IV. Match up the synonyms

a) to create, device, to keep, to carry out, man-made, to grip, fast, to define, to enable, essential, to include, complicated, to appraise, to exclude

b) artificial, to determine, to produce, quick, to eliminate, gadget, to grasp, to hold, to perform, vital, to evaluate, to permit, to comprise, sophisticated

V. What is the topic of Robots associated with in your mind? Could you put your ideas into separate words and sort them according to parts of speech? Try to make up sentences on the subject using the words from your lists.

VI. What do you know about robots? What are the benefits of replacing people with robots? In what spheres in the modern society is the use of robots the most efficient and perspective?

VII. Read the text. Try to understand all details.

Text A

What is a Robot

Man has always been interested in devices that work for him and make life easier. Numerous attempts to create such devices made throughout history resulted in the development of robots.

Almost everyone is familiar with the word "robot" in our civilized society. It was used for the first time in the drama title "Rossum's Universal Robots" which a Czech playwright Karel Capek produced in 1920. The word was coined from "robota" which means to work or a serf.

A robot is thought to be a man-made machine that does the work of a human being and looks like him. One of the attempts to build a mechani-

cal man was made by an Englishman named Roger Bacon. But one of the first true robots was an invention made by James Watt. He was the same man who invented the steam engine. Watt wanted a device to control the speed of a steam-driven machine to keep it from going too fast. He built a device that would cut off the steam to the machine if it was going too fast. This was a true robot because it was self-regulating.

Real progress in robot making began in the late eighteenth and nineteenth centuries. This was a period called the "Industrial Revolution". The invention of new kinds of machinery caused a change in ways of making things. After the Industrial Revolution almost everything was made by machines. At first these machines were controlled by human beings. This took a lot of time and effort. There was a need for better methods of control. So men began to invent robots. But it was not until electronic computers gave machines a "brain" and a "memory" that true robots began to appear.

Electronic brains give automatic devices a memory and can instruct them what to do under varying conditions.

When scientists first learned to make electronic machines duplicate some of the thinking processes of men, true robots became possible.

A robot is a gadget, which wholly or in part imitates man-sometimes in appearance and sometimes in action. Basically a robot is a machine, which moves, manipulates, joins or processes components in the same way as human hand or arm. It consists of three elements: the mechanical structure (including the artificial wrist and gripper), the power unit (hydraulic, pneumatic or, increasingly, electrical) and the control system (minicomputers and microprocessors). However, the essential characteristic of a robot is that it can be programmed to carry out and repeat a series of operations. Its gripping device is moved under the control of a man through a series of movements of grasping, positioning and orienting. It stores the information in a computer or other mechanical storage system and repeats these movements over and over again.

A robot is defined as a hybrid of mechanical, electrical and computing engineering.

The automatically controlled industrial manipulators are divided into three generations: programmed, adaptive and intellectual.

All the industrial robots in stamping, mechanical processing, forge and foundry work as well as in loading and unloading that have been widely

introduced belong to the first generation - the programmed robots. Characteristic of the first generation robots is that their control system acts according to a rigid often-repeated programme all the time.

The main difference between the programmed robots and adaptive robots belonging to the second generation is that the latter possess the most elementary senses in their manipulators - tactile (sense and touch), power (reaction to the magnitude of the work effort), locating (reaction to the distance to the object and the speed of approaching it), and light (reaction to the object located within a beam of light) and subsequently micro process the information.

The third generation - intellectual robots possess far richer means for sensing (including sight), for appraising the situation, and for processing information with a view to adopting a decision and carrying it out using drives and organizing the purposeful movement of the manipulator. Therefore, the intellectual robots can be considered as the machines possessing elements of artificial intellect. However, this doesn't enable to exclude a human operator in solving complicated problems demanding human experience.

The need for robots in the modern world is growing daily. Robots serve mankind in thousands of ways. They can operate practically anywhere, perform a great variety of duties and do many things that would be physically impossible for a man. Robots can be a substitute for man in routine work which is often very monotonous and dull, and a worker gets tired of such work very soon. Robots are very helpful in different industries, in scientific and research laboratories, in space exploration. The use of robots has produced a number of economic and social advantages such as the improvement in productivity and product quality, prevention of labour accidents, the development of new industries.

VIII. Say in what connection the following phrases and word combinations are used. Give their Russian equivalents.

Numerous attempts, the development of robots, to be a man-made machine, to control the speed of a steam-driven machine, a change in ways of making things, a need for better methods of control, to duplicate some of the thinking processes of men, the power unit, to carry out and repeat a series of operations, three generations, a rigid often-repeated programme, the most elementary senses, elements of artificial intellect, a substitute for man.

IX. Choose the proper word in the following sentences.

1. A robot must (imitation, imitate) the manual actions of human beings.
2. These devices though (differ, different) in shape are of the same type.
3. The power unit is a (type, typical) feature of robots.
4. Although robots vary (wide, widely) in shape, size and (capable, capability), they are made up of several (basic, basically) components.
5. A robot can be called a (programming, programmable) device.
6. Robots are (power, powerful) tools for increasing (productivity, production).
7. It is rather difficult to (classification, classify) industrial robots.
8. The term "robot" is (most, mostly) associated with the manipulator.

X. Fill in each gap with a preposition. Some can be used more than once.

In, from, of, to, for, according to, with, by

1. Robots are best understood __ terms of their capabilities.
2. There are numbers of characteristics essential __ any robot.
3. Robot capabilities range __ very simple motions __ extremely complex movements.
4. A hand is attached __ the wrist capable __ grasping a work piece.
5. A power unit is required __ each robot articulation.
6. Industrial robots differ __ other automatic machines.
7. Industrial robots are made __ the following basic elements: the manipulator, the power unit and the control system.
8. Robots move __ four basic design variations.
9. Robots are used to load and unload parts __ connection __ other machines.
10. Robots perform operations analogous __ those carried out __ human arms.

XI. Agree or disagree with the following statements. Correct the wrong statements.

1. Man has never made attempts to create devices working for him.
2. The word "robot" is familiar to practically everyone in the modern society.
3. True robots became possible when electronic computers gave such machines a "brain" and a "memory" and they could be instructed what to do under varying conditions.

4. The fact that robots can be programmed is of no importance.
5. Robots of three generations possess the same properties, there is no essential difference between them.
6. The use of robots in the modern world is very wide, they can perform a great variety of jobs.
7. Robots will substitute a human being in all spheres in the future.

XII. Give answers to the following questions.

1. Why did man invent robots?
2. What famous scientists and inventors made the contribution to the development of robots?
3. What is the origin of the word "robot"?
4. When did true robots become possible?
5. What is the structure of a robot and its essential characteristic?
6. How is it possible to define a robot?
7. What features do robots of three generations posses? What distinguishes robots belonging to different generations?
8. In what spheres can robots be used most effectively? What advantages has the use of robots resulted in?

XIII. Divide the text into logical parts, define the key idea and suggest a title for each part. Write an outline of the text.

XIV. Read the following paragraph. Every seventh word is missing. Fill in each blank with the proper word.

ideas, of, in, human, jobs, design, tractors, a, like, robots, used

When robots are widely used in the home, they will probably be used to do cleaning, table-laying, scrubbing and washing-up, but it is considered unlikely that they will be used to do the cooking-at least, not in the near future.

In factories mobile robots are already ... to carry out a large number ... the distribution and assembly tasks while ... beings carry out research and produce ... for new products. Amongst the numerous ... on the farm, robots will drive ... , keeping their eyes on the ground ... front to guide the tractor along ... straight line.

The majority of the ... used at present do not look ... human beings at all because their ... is chiefly functional.

Text B
Robots in Space.

I. Look through the list of the words and word combinations facilitating understanding of the text.

to roam –	странствовать, бродить
sci-fi –	science fiction – научная фантастика
facility –	зд. научно-исследовательское учреждение, организация
rover –	самоходный аппарат (букв. скиталец, бродяга)
core –	ядро, сердцевина
alien –	чуждый, чужестранный, зд. внеземной
to withstand –	выдерживать, противостоять
relevant –	относящийся к делу
to insure –	обеспечивать, гарантировать
remote sensing –	дистанционное зондирование
behaviour –	поведение, режим работы, состояние, свойства
intelligent behaviour –	разумное поведение
data visualization –	отображение данных
to drill –	сверлить, бурить
carbonate –	карбонат
carbon dioxide –	углекислый газ
obstacle –	препятствие, помеха
to accomplish –	выполнять, доводить до конца
uneven terrain –	неровная, пересеченная местность
outpost –	аванпост, отдаленное поселение
fascinating –	восхитительный, пленительный
premise –	предпосылка
dexterity –	ловкость, умение, способности
dexterous –	ловкий, способный, умелый
anthropomorphic –	антропоморфический
state-of-the-art –	реальный, достигнутый, достигнутый уровень развития
avionics –	авиационное (радио) электронное оборудование
data acquisition –	получение и накопление данных
to venture –	рисковать, решиться, осмелиться

NASA – National Aeronautics and Space Administration – Национальное управление по аэронавтике и исследованию космического пространства.

II. Before reading the text try to predict what problems will be discussed in it choosing the statements from suggested below:

- Russia's achievements in the development of robotic systems
- the USA's achievements in this field
- the developed robotic systems for space exploration and their missions.

Read the text to check if your predictions were correct.

Robots in Space.

Robots roaming the surface of Mars? Sounds like something out of sci-fi novel, doesn't it? It's really happening. Only NASA is using the robots for research projects – not for Star Wars adventures. Jet Propulsion Laboratory (JPL), a research and development facility run by the California Institute of Technology for NASA focuses on robotic space exploration.

Their specialties are robotic spacecraft and rovers, smart machines that are sent out into the solar system to act as workhorses and field geologists. The main mission of these robots is to collect surface, core and water samples from other planets – primarily Mars – for scientists to study back on Earth. From this data, researchers can determine a planet's physical history and evaluate existing conditions – key elements in the search for alien life.

Probably the most memorable rover was the SoJourner, which explored the surface of Mars in 1997. Presently, NASA and JPL are testing more sophisticated rovers and prototypes that demonstrate a higher degree of mobility, and can withstand the challenges of high-risk space exploration.

FIDO

FIDO, of Field Integrated Design and Operations, represents NASA's latest and greatest in robotic technology. The FIDO rover is being used to conduct research relevant to current and future robotic missions on Mars. Its job is to simulate field trials and mission operations on Earth so scientists can study its functionality and insure its success once

in space. This includes navigation, data collection, remote sensing, intelligent behaviours, data visualization and instrument placement.

Weighing 150 pounds, the rover has a mini-corer to drill and collect surface samples, as well as a microscopic camera to take photos of the drilling. Ultimately, the scientists hope to find carbonate materials, indicative of a carbon dioxide atmosphere. This would also suggest the possibility of life on Mars.

FIDO's advanced technology enables it to navigate over long distances on its own, avoiding natural obstacles without communication from a controller. It also uses a robot arm to manipulate instruments.

Although the current focus is the exploration of Mars, scientists look forward to expanding their space investigation to include Venus, Jupiter's moon Europa, and Saturn's largest moon Titan.

Robotic Construction Crew

Can you imagine a team of robots cooperating and skillfully coordinating a construction project? NASA researchers have developed a Robot Work Crew that can organize their individual sensory and control behaviors to accomplish a given task. These robots can maneuver over uneven terrain, avoid obstacles, transport payloads, manipulate equipment, and solve problems.

Their individual systems are programmed with both simple and complex behaviors that are made to respond appropriately in a group situation – their autonomous intelligence is distributed across the robot team. These robots are also equipped with a decision-making process, a shared network of sensing and control, and reactive behaviors. This is all made possible by the innovative software called Control Architecture for Multi-robot Planetary Outposts, which serves as a common controlling brain for the robot crew. In one particular experiment conducted by JPL, two such rovers approached an 8-foot long container and gripped it, then carried across a distance in excess of 50 meters.

This fascinating multi-robot cooperating technology, though still in the experimental stage, could conceivably build outposts, deploy power stations, and set up camp on Mars – all without human presence.

Robonauts

Now NASA has designed the Robonaut – a humanoid robot created by the Robot Systems Technology Branch at the Johnson Space Center.

The premise for the Robonaut is the development of a robotic system that can perform highly dexterous tasks – the humanoid robot is configured with two arms, two five-fingered hands, a head and a torso. The advanced technology brings together anthropomorphic robotic systems, multiple use tool handling, modular robotic systems components, and telepresence control systems.

This state-of-the-art design combines dual-arm operations with acute telepresence control by a human operator. With over 150 sensors per arm, the control system for the Robonaut includes an onboard real time CPU with miniature data acquisition and power management in a small, environmentally hardened body. The sophisticated design includes embedded avionics elements in the arm structure and a biologically – inspired neurological system.

NASA aimed to build a robot that could aid in space exploration and work in conjunction with humans and also venture into areas that are too dangerous for people. Scientists are striving to create the humanoid robot with dexterity that surpasses the suited human astronaut. The ability for the Robonaut to use its arms and hands to accomplish tasks is vital to its use, as it is expected to aid in assembly missions for the International Space Station and work directly with a wide range of interfaces with special tooling.

III. Discuss NASA's research projects on space exploration and the robotic systems developed for this purpose.

IV. Speak on the peculiarities of the robotic systems mentioned in the text. What are the most prominent and fascinating features of these robots? What made it possible to achieve such a high level of development?

V. Try to predict future development of robotic systems. What trends in this field are the most promising? What purposes will it be possible to use robots for?

VI. Compress and transform the text into a ten-sentences-long abstract.

VII. Comment on the present day situation in the field of robotic technology in the USA and Russia. Try to find some information about Russia's achievements in this field.

Text C

I. Skim through the text. Try to guess the meaning of unknown words from the context. Be ready to speak in detail on the device described in the text.

A silicon microrobot just half the width of a human hair has begun to move around in a Los Angeles lab, using legs powered by the pulsing of living heart muscle. It is the first time muscle tissue has been used to propel a micromachine.

This development could lead to muscle-based nerve stimulators that would allow paralyzed people to breathe without the help of a ventilator. And NASA which is funding the research hopes swarms of crawling "musclebots" could one day help maintain spacecraft by seeking and repairing micrometeorite punctures on spacecraft.

The device is an arch of silicon 50 micrometers wide. A cord of heart muscle fibres is attached to the underside of the arch. It is the contraction and relaxation of this tissue that makes the arch bend and stretch to produce the bot's crawling motion. And the muscle is fuelled by a simple glucose nutrient in a Petri dish.

The prospect of using living muscle to power microelectromechanical systems (MEMS) is an attractive alternative to micromotors. While motors need electricity, muscles can draw their energy from glucose – perhaps deposited on the surface where the robot will be working. The research team's breakthrough is to have developed an automated way of anchoring muscle tissue to a substance like silicon. The team carved an arch-shaped skeleton from a wafer of silicon using automated microchip manufacturing equipment and coated it with an etchable polymer.

Then they etched away the coating on the underside of the arch and deposited a gold film there. This acts as an adherent for the muscle cells. To grow the muscle the skeleton was placed in a Petri dish containing cardiac muscle cells in a glucose culture medium. Over three days the muscle cells grew into muscle fibres that attached themselves to the gold underside, forming a cable of cardiac muscle running the length of the arch. During this process the arch was held in place by a restraining beam. When this was removed the musclebot immediately started crawling at speeds up to 40 micrometers per second.

However, the research team stresses that possible applications of the microbots are several decades away since some significant issues still remain unsolved.

II. Practise “question – answer” type of reproduction of the main ideas of the text.

III. Suggest a suitable title for the text.

IV. Evaluate the importance of the use of robots in the field of medicine.

V. Write an essay on the problem “Robots and their influence on our life today and in future”.

UNIT 9

Grammar review: The Infinitive
Reading: Microelectronics
Grammar review: The Infinitive and Infinitive Constructions.

I. Use the appropriate form of the infinitive and translate the sentences.

A. Simple, Continuous, Perfect.

1. He seemed (to think) about something and did not hear me (to enter) the room.
2. They make such a noise, they must (to argue) about something.
3. I was given a free choice whether (to cooperate) or not.
4. Our friends are unlikely (to return), they are (to return) only tomorrow.
5. We are lucky (to pass) all the exams successfully.
6. I am sorry (to disturb) you, but the matter is urgent.
7. It was so kind of you (to invite) us to the reception. We are happy (to have) such an honour.
8. She was sorry (not to warn) her friend she would not be able (to keep) the date.
9. The man pretended (to read) a newspaper and not (to notice) us.
10. The possibility that he could (to mistake) never occurred to him.

B. Active or Passive.

1. I'd like (to help) you but I do not know what I can (to do) unless I am told the truth.
2. This device must (to handle) with care.
3. He did not like (to bother) when he was working.
4. This chance is not (to miss).
5. He was the only one (to invite) to take part in the conference.
6. There are a lot of people at the institute: the teachers have come (to examine) students and students (to examine).
7. He was very punctual hating both (to wait for) somebody and (to wait for) by somebody.
8. In the laboratory the students will be given substances (to analyse) and chemicals (to analyse) them.
9. He likes (to ask) all kinds of questions but he does not like (to ask) questions.

10. It was so kind of them (to prepare) everything before our arrival.
11 .His intention was (to elect) for the second term.

II. Use the particle "to" before the infinitives where necessary.

1. You have ... work hard at your English ... be able ... speak it.
2. You need not... speak so loudly, I can ... hear you very well.
3. If you fail, why not... take a chance again, you may ... be luckier next time ... become a winner.
4. I wonder what made him ... take such a decision.
5. The teacher's argument caused me ... change the subject of my course paper.
6. It was too far ... walk, but he was impossible ... persuade ... take a taxi.
7.This book should help you ... understand the lecture.
8. I have not heard anyone ... call me.
9. She appears ... make progress in languages.
10. Julie made the insurance company ... pay for the repairs.
11. Philip got his friends ... take notes of the lecture for him.
12. It is wonderful what you can get computers ... do.
13. We are going ... have our car fixed before we go to Toronto.
14. He felt someone ... walk behind him and was uncomfortable.
15. I have never heard her ... speak English.
16. Do not let that... bother you.
17. They are unlikely ... agree to our proposal, they do not seem to.
18. Education is changing very rapidly today. In the past teachers used to make children ... sit still for hours. They made them ... memorize everything. Today many teachers wonder if it is possible to make children ... learn at all. They say you should let children ... learn and ... discover things for themselves.

III. Compare the sentences and translate them.

1. We saw him enter. He was seen to enter.
2. We know him to work 10 hours a day. He is known to work 10 hours a day.
3. The director believed the staff to know about the meeting. They were believed to know about the meeting.
4. Nobody expected the picture to be exhibited. The picture was not expected to be exhibited.
5. We supposed him to be a first-year student. He was supposed to be a first-year student.

6. The newspapers report the exhibition to be opened next week. The exhibition is reported to be opened next week.
7. They believed the problem to have been solved at last. The problem was believed to have been solved at last.

IV. Paraphrase the sentences.

a) using Complex Subject

Model: We suppose the film is interesting.
The film is supposed to be interesting.
I doubt if they will come on time. They are unlikely to come on time.

1. I am afraid I have lost the keys.
2. The newspaper reports said that the visit of the President was postponed.
3. They can not know the truth.
4. We expect they will come to an agreement.
5. It seemed that the father and the son were almost exactly alike.
6. They apparently were not interested in the particulars.
7. They say the article has aroused quite a scandal.
8. It so happened that we wasted a lot of time there.
9. It appeared he had been long out of practice.
10. It so happened that the news of the accident had spread.

b) using Complex Subject instead of Complex Object

Model: Everybody expected him to say something.
He was expected to say something.

1. The teacher made me write the test again.
2. His father expected him to become a businessman.
3. The unexpected circumstances caused her to change her plans.
4. We heard them constantly talk about the difficulties of studies at the university.
5. She made him apologize to her.
6. I believe everybody to have made the same mistake.
7. My parents expected me to follow in their steps in career.
8. We considered the idea to be reasonable.
9. They expected her to pick up some English during the trip.
10. He supposes the work to be done today.

V. Translate the sentences using Complex Object.

1. Ему хотелось бы, чтобы:
   a) она дала обещание приехать;
   b) мы решили этот вопрос вместе с ними;
   c) вы объяснили, как пользоваться этим устройством;
   d) мы договорились о встрече;
2. Я не хочу, чтобы:
   a) вы говорили ей неправду;
   b) они решили этот вопрос без меня;
   c) вы летели туда самолётом;
   d) вы забыли свои обещания;
3. Мы ждали, что:
   a) вы скажете что-нибудь по этому вопросу;
   b) она объяснит нам, почему она не пришла;
   c) вы сделаете всё, чтобы закончить работу вовремя;
   d) наш концерт понравится им;

VI. Translate the sentences. Define the function of the infinitive or the type of the infinitive construction.

1. The model to be tested was submitted to a special commission.
2. Engineers study mathematics to be able to make complicated computations and to acquire practical skills in making drafts.
3. Research work to follow experimenting should be carefully done.
4. The machine to be assembled will be more effective than that of a recent design.
5. To harden the metal it is necessary to subject it to intense heat.
6. We believe Pythagoras to have been the founder of a school to train students in mathematical thinking.
7. We study the elements to be able to make use of their properties.
8. Science has shown the electron to be a peculiar combination of mass and electrical charge.
9. Having thoroughly studied the contemporary theories of electricity A.S. Popov was one of the first to use practically the results obtained by H. Herts.
10. There are prospects for lasers to be used in long distance communication and for transmission of energy to space stations.
11. Achievements in radioengineering are believed to have laid the foundation for further progress in the field of long-distance communication.

12. It is difficult to name all the branches of science and technology which are based on electronics.
13. A laser is a device that stimulates the electrons of a light-producing material to vibrate simultaneously giving off a light with tremendous energy.
14. The circuit can be broken to interrupt the flow of electricity.
15. A system of Earth satellites appears to have solved the problem of transmitting the central TV program to any part of the world.
16. Solar and atomic batteries are used to supply power to transmitters in spacecrafts because of their long life.
17. The application of integrated circuits allowed engineers to reduce the dimensions of electronic devices and increase their reliability.
18. Since any calculation which is to be performed with the aid of a digital machine must be broken down into sequence of elementary steps, it follows that any problem that can be broken down in this way can be solved by the machine.
19. Many infrared detectors must be cooled to low temperatures to show useful sensitivity.
20. To maintain a constant temperature in a container is an important technical problem.
21. The magnetic fields of galaxies are believed to play an important role in the universe, despite the fact that they are estimated to be a hundred thousand times weaker than the magnetic field on earth.
22. Every few years powerful new techniques are known to be developed which are able to replace the older ones.
23. This experiment is beautiful and enables one to determine the orbits of cosmic-ray particles assuming a dipole field for the earth.
24. As the voltage applied between the electrodes in an ionization chamber is comparatively low, each quantum of X-rays absorbed produces only a small burst of current, too small to be recorded individually by any normal method.
25. Several requirements are to be met to make such a device operate efficiently.
26. Having small size and other useful properties transistors make it possible to produce devices which cannot be made with vacuum tubes.
27. The maser can also be used to measure more precisely the effects of gravity and velocity on time which was predicted by Einstein.
28. High noise level with this circuit makes it difficult to distinguish useful signals.

29. With this arrangement it is possible to adjust the electrical length of the elements to give the optimum gain.
30. An analytical solution in algebraic form often allows information to be obtained relatively easily.
31. A computing machine is able to take in and store information because within the machine there is equipment, which can be positioned to express that information.
32. The field of active networks has undergone change with the appearance of new kinds of problems to solve and new kinds of structures to employ.
33. For the results to be reliable you must have them tested again and again.
34. The automatic return of samples from the Moon seems to provide the only possible way for obtaining soil and rocks from unvisited – and perhaps unvisitable- regions such as the far side of the Moon.
35. The function of the control unit is to take the operating instructions one by one in the appropriate order and to ensure that they are correctly carried out.

VII. Translate the sentences into English.

1. Мы знаем, что радио играет огромную роль в жизни человека.
2. Можно сказать, что радио широко используется как лучшее средство для космической связи.
3. Радио позволяет нам осуществлять связь с самыми отдалёнными частями мира.
4. Предполагают, что эксперимент, который необходимо провести, даст лучшие результаты.
5. Было создано новое устройство для того, чтобы и передавать и принимать сообщения с более высокой скоростью.
6. Невозможно решить многие современные сложные технические задачи без помощи компьютеров.
7. Студенты, по-видимому, обсуждают эту проблему уже час.
8. Это заставит тебя подумать, как исправить ошибку.
9. Мы ожидали, что делегация приедет в конце недели.
10. Первокурсникам важно понимать эту основную проблему.
11. Он распорядился, чтобы они усовершенствовали конструкцию.
12. Материал, который необходимо использовать, был тщательно исследован.
13. Говорят, что она уже закончила институт.

14. Мы ожидаем, что он выступит с докладом на конференции.
15. Наша задача – развивать технологические процессы без непосредственного участия человека.
16. Неудовлетворительная работа устройства заставила исследователя реконструировать его.
17. Они не ожидали, что мы закончим работу без их помощи.
18. Оборудование, необходимое для проведения лабораторных экспериментов, было очень сложным и дорогим.
19. Думали, что он всё ещё работает над своей статьёй.
20. Они не знали, что результаты необходимо было обработать так срочно.
21. Голос человека, как известно, содержит более высокие частоты.
22. Оператор считал, что усилитель достаточно мощный для данной операции.
23. Электронная технология сделала возможным создание автоматических систем связи.
24. Мы знаем, что они завершили своё исследование.
25. Новые средства связи, вероятно, появятся в будущем.
26. Много проблем пришлось преодолеть, прежде чем система, отвечающая необходимым характеристикам, могла быть введена в эксплуатацию.
27. Открытие, как известно, вызвало сенсацию.
28. Вы должны сделать всё от вас зависящее, чтобы коренным образом усовершенствовать устройство.
29. Лазеры, безусловно, выполняют некоторые операции лучше и экономичнее, чем другие устройства.
30. Сегодня, как известно, полупроводники широко используются в телевизионных и радиоприёмниках и в компьютерах.

Reading Microelectronics.

I. Read and memorize the following words:

1. impurity – примесь
2. diffusion – рассеивание; диффузия, проникание;
3. oxide layer – оксидный слой;
4. etching – гравирование (травлением); травление;
5. expose – выставлять, подвергать действию чего-либо;
6. mask – маска; (фото)шаблон;
7. deposit – осаждать, наносить;

8. interconnection – (внешнее) межсоединение;
9. encapsulate – заключать в корпус, в капсулу; корпусировать;
10. substrate – подложка, основание;
11. evaporate – испарять; выпаривать, напылять;
12. sputter – разбрызгивать, распылять;
13. silk-screen printing – шелкография, шелкотрафаретная печать;
14. μm – micrometer – микрометр.

II. Analyze the following derivatives. Translate them and find their roots.

Inseparable, diffusion, photographically, interconnection, encapsulation, thickness, dimensional, additional, combination.

III. Match up the synonyms.

a) size, to indicate, precisely, to define, to produce, insulator, to connect, pattern, reason;
b) to manufacture, cause, to join, dimension, to determine, sample, accurately, dielectric, to point out.

IV. Give the Russian equivalents of the following terms and word combinations. Can they be referred to the field of microelectronics?

An integrated circuit, film techniques, a hybrid circuit, semiconductor material, an aluminium film, a passive component, an active component, a microminiature encapsulation, an unencapsulated chip.

V. Choose the term from the list for the corresponding definitions given below.

Electronics, microelectronics, circuit, micro-circuit, integrated circuit, reliability, micro-assembly.

1. A conductor or system of conductors through which an electric current is intended to flow.
2. The branch of science and technology, which deals with the study of the phenomena of conduction of electricity in a vacuum, in a gas, and in semiconductors and with the utilization of devices based on these phenomena.
3. A microelectronic device having a high component density, which is considered as a single unit.

4. The concept of the construction and use of highly miniaturized electronic circuits.
5. A micro-circuit, in which the various components and/or integrated micro-circuits are constructed separately and can be tested before being assembled and packaged.
6. The ability of an item to perform a required function under stated conditions for a stated period of time.
7. A micro-circuit, in which a number of circuit elements are inseparably associated and electrically interconnected such that for the purposes of specification and testing, commerce and maintenance, it is considered indivisible.

VI. Read the text. Try to understand all details.

Text A
Techniques for microelectronics.

The term microelectronics is a general one indicating the small size of electronic devices. Today two techniques are classified as microelectronics: the integrated circuit and the film techniques. Sometimes the two techniques are combined to form hybrid circuits.

A monolithic integrated circuit is an inseparable assembly of circuit elements formed in a small piece of semiconductor material. The material used at the present time is silicon, and the piece of silicon in which the elements are formed is called a chip. Circuit elements are formed by impurity regions made by a sequence of diffusions. The diffusion regions are precisely defined by windows in a thermally-grown oxide layer over the surface of the silicon. These windows are produced by etching after the surface has been photographically exposed through a mask. This combination of photographic and etching techniques provides the precision required to form circuit elements of such small size. Completed elements are connected by an aluminium film deposited over the surface of the silicon and etched into the required interconnection pattern. The completed structure is then encapsulated. Such a device not only has a small size, but also a high reliability and, because of the mass – production techniques that can be used in the manufacturing process, a low unit cost.

The monolithic integrated circuit is the most widely used microelectronic device at the present time.

In the film technique for microelectronics the passive components and interconnections for a circuit are formed by metal or semiconductor – material films deposited on an insulating substrate. The active components can also be formed by films, but they require additional manufacturing stages. It is more usual, for economic reasons, to use microminiature discrete transistors and diodes which are connected into the film pattern. These active devices can either be in microminiature encapsulations, or the unencapsulated chip in which the active element has been formed is connected into the pattern and the completed film circuit is encapsulated.

Two approaches to the film technique can be used: the thin-film and the thick-film processes. In the thin-film circuits the thickness of the film is between 0.01and 1 μm approximately; the thickness of the thick-film circuit is between 10 and 50 μm approximately. There is no dimensional division between the two processes, and in practice the difference is determined by the way the film is formed. Thin films are formed by evaporating or sputtering material onto the substrate, while thick films are formed by a process similar to silk-screen printing.

VII. Say in what connection the following phrases are used. Give their Russian equivalents.

An inseparable assembly of circuit elements; a thermally-grown oxide layer; photographic and etching techniques; the required interconnection pattern; an insulating substrate; microminiature discrete transistors and diodes; the thin-film and the thick-film processes.

VIII. Fill in the blanks with the proper word choosing it among the words suggested in brackets.

1. The term … (electronics, circuit, microelectronics) is a general one indicating the small … (scale, size, value) of electronic devices.
2. A … (hybrid, electromagnetic, monolithic) integrated circuit is an … (separated, inseparable, considerable) assembly of circuit elements formed in a small piece of … (semiconductor, transistor, insulator) material.
3. Circuit elements are formed by … (bandgap, interface, impurity) regions made by a sequence of … (depositions, diffusions, evaporation).
4. Completed elements are connected by an … (lithium, aluminium, titanium) film deposited over the surface of the silicon and … (etched, cut, treated) into the required interconnection … (device, region, pattern).

5. In the film technique for microelectronics the … (active, passive, discrete) components and interconnections for a circuit are formed by metal or semiconductor-material … (masks, films, conductors) deposited on an insulating … (impurity, layer, substrate).

6. These active devices can either be in microminiature … (installations, encapsulations, micro-assemblies), or the unencapsulated … (system, substrate, chip) in which the active element is connected into the pattern and the completed film circuit is … (electroplated, pressurized, encapsulated).

IX. Complete the following sentences in Russian and then translate them into English.

1. В настоящее время две технологии классифицируются как микроэлектроника …
2. Области рассеивания точно определяются окнами в …
3. Эти окна создаются травлением…
4. Такое устройство не только малогабаритно, но и обладает высокой надежностью и …
5. Более обычной практикой, в силу экономических причин, является использование микроминиатюрных …
6. В тонкопленочных схемах толщина пленки …
7. Тонкие пленки образуются напылением или …

X. Discuss the techniques used in microelectronics. Speak on the structure of microelectronic devices, procedures and materials used in the production process.

XI. Express your views on the advantages or drawbacks and perspectives of the two techniques. Which of them is more economical and easier to produce, more reliable and precise? Try to prove your point of view.

Text B

I. Skim through the text and indicate the problems touched upon in it. Name the key words which help you to grasp the main points of the text.

Our present age is characterized by its exponentially growing[1] complexity. And we may expect the complexity of our existence to increase still further. Man's attempt to cope with this increasing complexity has

been more through electronics, complex computers, transmission methods and automation.

In the past microminiaturization in electronics was largely a practical enterprise[2] guided by experience, however, now fundamental relations[3] in this field are emerging.[4] It should first be made clear what the term "microelectronics" implies[5], since the name appears in many forms-microminiaturization, integrated electronics, microsystems electronics, molecular electronics, etc., and since the term is in itself somewhat misleading[6]. Microelectronics surrounds the entire body[7] of the electronic art which is connected with, or applied to the realization of electronic circuits, subsystems, or the entire systems from extremely small electronic parts (devices).

The primary interest in microelectronics stems[8] not from the fact that small size can be achieved, but from the much more important fact that the techniques used should ultimately lead to low cost, high reliability and improved performance. Small size is of extreme value in many applications, such as in space or in portable equipment. However, in the overwhelming[9] number of applications, small size is of only secondary interest while low cost, high reliability and improved performance are of great importance.

Scaled-down[10] separate component parts such as resistors, capacitors, inductors, diodes, transistors, and other separate electronic parts are used to assemble microminiature electronic circuits. Component parts are integrated into one single circuit. This approach has been developed along two major technologies.

In film circuits the component parts are evaporated, electroplated[11] and a separate substrate performs only the function of a mechanical support. Usually the component parts are interconnected in the process of their fabrication. In semiconductor integrated circuits the semiconductor material is used to fabricate component parts within a single piece of semiconductor which then becomes an entire circuit or part of a circuit.

A monolithic piece of material is treated[12] in such a way as to possess an electronic circuit function. Unlike previous categories, component parts[13] in functional circuit cannot be distinguished from one another, and the structure itself cannot be divided without its stated electronic function being destroyed. It should be noted that there can be many instances where the microelectronic circuit may combine more than one of these approaches in a single structure. For example, many thin-film circuits use individually attached active semiconductor devices, such as diodes and

transistors. There are also circuits which combine the semiconductor integrated circuits with thin-film component parts. These and similar combinations of various approaches are commonly referred to as hybrid approaches or hybrid circuitry.

Notes to the text

1) exponentially growing – возрастающий по экспоненте
2) practical enterprise – практическое дело
3) fundamental relations – фундаментальные положения
4) to emerge – появляться, возникать
5) to imply – подразумевать, предполагать, означать
6) misleading – вводящий в заблуждение, обманчивый
7) entire body – целый раздел
8) to stem – происходить, возникать
9) overwhelming – несметный, огромный, подавляющий
10) scaled-down – малогабаритный
11) to electroplate – гальванизировать, покрывать металлом с помощью электролиза
12) to treat – обрабатывать, подвергать воздействию чего-либо
13) component part – узел схемы

II. Make up English-Russian pairs of the word combinations equivalent in meaning.

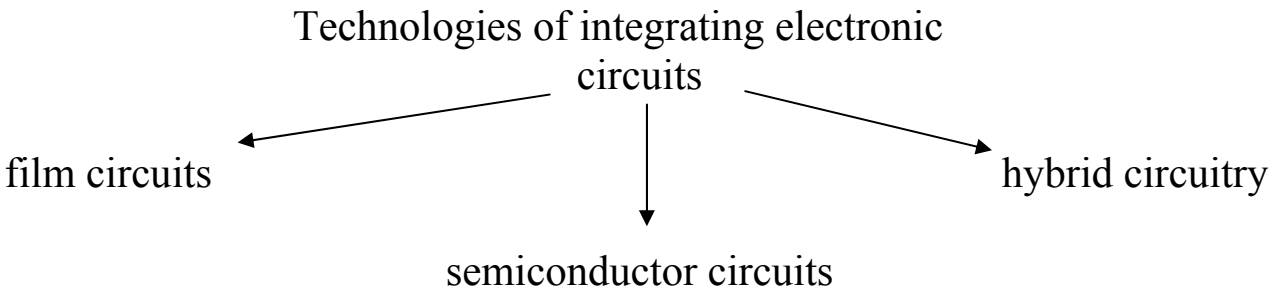
1) the realization of electronic circuits, subsystems or the entire systems	1) первостепенный интерес в области микроэлектроники
2) to cope with the increasing complexity	2) обладать функцией электронной схемы
3) extremely small electronic devices	3) создание электронных схем, подсистем или завершенных систем
4) to lead to low cost, high reliability and improved performance	4) космическое и портативное оборудование
5) the primary interest in microelectronics	5) справляться с возрастающей сложностью

6) scaled-down separate component parts	6) сочетать полупроводниковые интегральные схемы с узлами тонкопленочной схемы
7) space and portable equipment	7) приводить к низкой стоимости, высокой надежности и улучшенным характеристикам
8) to assemble microminiature electronic circuits	8) чрезвычайно маленькие электронные устройства
9) to possess an electronic circuit function	9) малогабаритные отдельные узлы схемы
10) to combine the semiconductor integrated circuits with thin-film component parts	10) собирать микроминиатюрные электронные схемы

III. State if the following problems are discussed in the text.

The characteristics of our present age.
Electronics helps man to cope with the increasing complexity of the world.
Disadvantages of early large-scale systems.
Definition of microelectronics.
Primary interest in microelectronics.
Major approaches of integrating component parts into one single circuit.

IV. Discuss the technologies of creating electronic circuits using the scheme.



V. Suggest a suitable title for the text.

VI. Translate the texts in a written form.

1. Hybrid circuits

A hybrid circuit in the microelectronic sense is one combining both film circuits and monolithic integrated circuits. An alternative name often used is hybrid integrated circuit. The active devices, transistors and diodes, are formed by diffusions in the integrated circuit chip. The resistors and capacitors are formed by the thin-film or thick –film techniques on a substrate. An interconnection pattern is also formed on the substrate and the integrated circuit chip connected into the pattern. The completed circuit can then be encapsulated.

The hybrid circuit is an extension of the normal thin-film technique where discrete transistors and diodes in microminiature chip form are connected into the film circuit. Combining the active devices into one chip enables the volume required to be reduced. The technique can also be used with monolithic integrated circuits where resistors of a higher dissipation than can be conveniently included in the chip are required.

Linear circuits operating at high frequencies can also use the hybrid technique with advantage. The capacitance associated with diffused resistors can impose limits on the gain-bandwidth product at high frequencies in some integrated circuits. Using thin-film resistors can overcome this limitation. Similarly, thin-film capacitors can be used to avoid parasitic effects that may occur with diffused capacitors. The thin-film circuit elements can be formed on the surface of the silicon chip in which the active components are diffused to form a compact device.

2. Microwave Integrated Circuits.

Thin-film circuits have found particular application at microwave frequencies in what have become generally known as microwave integrated circuits. Transmission lines for the electromagnetic waves are provided by microstrip lines, which are conveniently formed by thin-film techniques. A microstrip line consists of a substrate of high dielectric constant, one side of which is coated with a metal film to form a ground plane, while the other side supports a thin narrow strip. With this structure the transmitted electromagnetic wave is contained almost entirely inside the substrate. Distributed passive components can be made simply by forming the microstrip line into the required pattern, and such components as bandpass filters, circulators and directional couplers can be made which are considerably smaller than components using waveguides and coaxial lines. Discrete microwave semiconductor devices can be added to

such components to make active components such as amplifiers, mixers and oscillators. Lumped circuit components can also be made by thin-film techniques. Complete microwave systems can therefore be formed on the substrate and they are considerably smaller than systems using conventional components.

Microwave integrated citcuits enable smaller and lighter components and subsystems to be constructed. Applications for these circuits are therefore those where small size and low weight are advantageous, guided missiles and airborne radar and communications systems are typical examples. Ground-based applications include portable and mobile systems.

VII. Think of some problem questions dealing with microelectronics and discuss the state-of-the-art in the field of microelectronics and perspectives of its development.

Учебное издание

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Часть 2
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**ГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ
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