BACK INTO THE PAST

<=>

FORWARD INTO THE FUTURE

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BACK INTO THE PAST ⇔ FORWARD INTO THE FUTURE

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Back into the past ⇔ forward into the future

(УЧЕБНОЕ ПОСОБИЕ)/Составители: доц. Н.А.Клушин, преп. И.Н.Напалкова, ст.преп.Н.Б.Шестакова.- Нижний Новгород: ННГУ,2014- 30 с.

Учебно-методические материалы по английскому языку предназначены для студентов 2-5 курсов, магистрантов и аспирантов радиофизического факультета для обучения и развития навыков устной и письменной речи, связанных с профессиональной деятельностью. Современная методика в обучении языка специальности и аутентичные материалы отражают новые тенденции в обучении разговорному английскому языку на основе проблем радиофизики и информационных технологий.

PREFACE

We have compiled the following materials for the undergraduates, advanced and postgraduates both in Radio Physics and Information Technologies. The updated version will help you keep on your toes in English studies thanks to its authentic data and modern methodology content training all together reading, writing and speaking skills on the broad scientific basis. An insight into lexis and word formation will hopefully give you a push forward in workshops and conferences communication.

Unit 1

1. Read the following international words and translate them without a dictionary:
   laser, photon, opposite, radiate, generate, generator, sphere, electron, quarts emission
2. Read and learn the following key words, be able to use them in speech:
   current – ток
   reflect – отражать
   absorb – поглощать
   agitate – волновать, возбуждать, встряхивать
   emit - излучать
   avalanche - лавина
   collide – сталкиваться
   ether – эфир
   ethereal – эфирный
   irradiation – блеск, сияние
   irradiate – излучать
   axis (axes, pl) – ось
3. Form nouns of the following verbs:
   Emit, collide, irradiate, agitate, radiate, absorb, reflect, compress, contain, generate, occur, form, increase, decrease

Reading

1. Make one text putting the paragraphs A-E into the correct order from 1-5.

Principle work of lasers

A. A part of the photons moving along the tube in two directions hit the mirrors from which they are reflected into the opposite direction. A low-density ether path is formed along the tube due to the multiple passages of photons. This path is compressed by the more condensed ether which enters through the wall of the tube from outside.
B. Most of the emitted photons hit the wall of the tube where they are either absorbed or go outside. But if the most part of a tube is covered with

material and has only a window for irradiation by the light, then almost all photons will be reflected from the tube inside and again to be absorbed and radiated by atoms.

C. But gas lasers are usually made of long round tubes which contain gases through which runs independent electric current from a high frequency generator. When electric current passes through a gas, the tangential (non-elastic) collisions of electrons with the gas atoms nuclei occur. Upon these collisions the ethereal spheres of nuclei emit photons.

D. Since the other pressure across the tube is higher than that along the tube, then the ethereal sphere of nuclei is being elongated in direction parallel to the axis of the tube. Upon the colliding of these nuclei with orbital electrons from the nuclei occurs emission of photons in the direction parallel to the axis of the tube. Thus, the avalanche-like nuclei agitation as well as photon emission in either mirrors direction form. Part of the emitted photons leave outside. Thus the unidirectional emission of photons from the laser is formed.

E. Inside of a glass or quartz tube there is a gas which is irradiated by light. If photons have suitable energy they at collision with gas are absorbed by the ethereal sphere of nucleus due to that the ethereal sphere is increasing. This radiation of photons occurs in different sides. Photons can be absorbed by other nucleuses and the second at collisions with orbital electrons can radiate again the photons.

A	B	C	D	E

2. Read the text. For items 1-7 match the ending of each sentence A-F to its beginning. There is one extra ending you do not need to use.

Not only gases can be taken as working bodies of lasers, **A**_____. Herewith the atoms of the active elements must **B**_____. The density of a photon beam characterizes its force, but the force and the value of cross-section of the beam characterize the power of the beam. The force of a laser beam also depends **C**_____.

Solid lasers could be more powerful than the gas and liquid lasers, since in solid photons have low velocities of motion only when they leave the laser, photons

increase their velocity to the limit. Due to that the photon beam inside the laser and upon leaving it may have high density **D_____**.

In the laser is formed a ray with small divergence because if increase the frequency of photons passing from a mirror to a mirror then the pressure of the ether is decreasing along the tube **E_____**. Due to that the ethereal sphere of the nucleuses is extended in the direction of the axis of the tube **F_____**.

1. and across a tube remains former;
2. which will not destroy the laser;
3. but also solids and liquids;
4. and the radiation of photons occurs also mainly in the axis of the tube;
5. on frequency of radiated photons, the more frequency the more force;
6. be agitated due to the action of extraneous photons used for the excitation of atoms;
7. since the beam will destroy the mirrors reflecting the photons.

A	B	C	D	E

3. For questions 1-10 read the text and decide whether the information in the sentences is RIGHT or Wrong. Write the correct letter (R/W).

Applications

Red HeNe lasers have many industrial and scientific uses. They are widely used in laboratory demonstrations in the field of optics in view of their relatively low cost and ease of operation compared to other visible lasers producing beams of similar quality in terms of spatial coherence and long coherence length (however since about 1990 semiconductor lasers have offered a lower cost alternative for many such applications). A consumer application of the red HeNe laser is the Laser Disk player, made by Pioneer. The laser is used in the device to read the optical disk.

The twentieth century was characterized by the harnessing of electrical energy to create broad economic and societal benefits. Examples of developments enabled by electricity include transport, heating, lighting and the recent explosive expansion of information and communication technologies. Looking to the future, innovative applications of energy in the form of light have the potential to shape the twenty-first century.

Some forty years ago, the principle of light amplification by stimulated emission of radiation (giving the acronym laser) was first postulated and since then lasers have matured into reliable and efficient industrial tools. Typical applications include cleaning of artwork and buildings, surgery, automotive manufacturing and shipbuilding. The present paper considers the use of lasers as manufacturing tools.

1. Red HeNe lasers have few industrial and scientific uses.
2. Red HeNe lasers have problems in operation.
3. Since about 1990 semiconductor lasers have offered a lower cost alternative for many applications.
4. The twentieth century was characterized by the development of electrical energy.
5. Early developments were enabled by electricity include transport, heating, lighting.
6. Innovative applications of energy in the form of light have no progress to shape the twenty-first century.
7. Since 70-s lasers have matured into reliable and efficient industrial tools.
8. The principle of light dispersion was first introduced some forty years ago.
9. The article considers the use of lasers as manufacturing tools.
10. Typical applications include artwork cleaning, surgery, automotive manufacturing and shipbuilding.

Grammar and Word Formation

1. Open the brackets. Put in the correct verb form.

The first HeNe lasers **1.____(emit)** light at 1.15 μm in the infrared spectrum and **2._____(be)** the first gas lasers. However, a laser that operated at visible wavelength **3._____(be)** much more in demand, and a number of other neon transitions **4._____(investigate)** to identify ones in which a population inversion can be achieved. The 633 nm line **5._____ (find)** to have the highest gain in the visible spectrum, **6._____(make)** this the wavelength of choice for most HeNe lasers. However other visible as well as infrared lasing wavelengths **7._____(be)** possible, and by **8. _____ (use)** mirror coatings with their peak reflectance at these other wavelengths, HeNe lasers **9. _____ (can)** be engineered to employ those transitions; this **10. _____ (include)** visible lasers appearing red, orange, yellow and green.

2. Insert the correct word form.

Laser direct metal deposition

For high value applications such as aero engine components it is generally economically _____ (***attract)*** to repair worn or locally damaged parts rather than _____ (***place)*** them. A candidate repair technology is laser direct metal deposition (DLMD) in which a laser is used to melt powder onto a substrate material. In contrast to approaches in which the powder is placed on the substrate, the powder is fed via a nozzle into the laser spot on the substrate, as illustrated in *Fig.8*. This results in the _____ (***form)*** of a _____***(melt)*** pool which, on cooling, leaves a solid deposit of the powder material on the substrate.

Laser deposition has two main advantages over other powder deposition techniques. _____ ***(First)***, the operation is a low heat input process which reduces the likelihood of liquation cracking. Secondly, the use of very small spot sizes enables highly accurate and reproducible deposits to be made. Additionally, _____ ***(adaptation)*** control systems have been developed that monitor the characteristics of the molten pool and adjust the process as necessary to maintain deposit quality. *Figure 9* shows a multiplayer deposit in an aero engine alloy.

In addition to repair, however, direct laser metal _____ **(*deposit)*** is suitable for _____ ***(origin)*** part build. By _____ ***(vary)*** powder composition as a part is built up, a _____ ***(functional)*** graded component can be developed with particular performance characteristics directly related to position. The process can also be used for rapid prototyping.

For the process to gain widespread acceptability, however,_____ ***(develop)*** is required to increase deposition rates, deposition _____ ***(efficient)*** and to establish appropriate processing parameters for high _____ ***(accurate)*** and quality.

3. Choose the necessary word.

All manufacturers are **1._____**striving to gain a competitive edge over their rivals and the advantages and disadvantages of each manufacturing route are thoroughly evaluated before production begins. Fabrication or **2. _____** with lasers offers several potential benefits:

- **3. _____**productivity - more rapid part manufacture at reduced cost.
- Improved quality - for example, minimal distortion and hence **4. _____** levels of rework.
- Enhanced performance - this can be seen by longer lifetimes or greater resistance to corrosion or high temperature. **5. _____** , laser repair

technologies can give rise to significant life extensions of otherwise exhausted components.

- Novel fabrication routes and components – where **6. _____**technologies simply are not available.

The choice of manufacturing route, however, is **7. _____,** an economic one. **8. _____**, there is a continuous battle between manufacturing technologies to gain a competitive edge that is closely analogous to the competition between individual manufacturers.

To respond to this challenge, developments in laser materials processing are being made to address the **9._____** of current technology and maximize potential. The present paper describes, somewhat selectively, developments and opportunities for manufacturing with lasers in three **10. _____**themes.

1. A .usually B. sometimes C. nowadays D. continuously
2. A .generate B. manufacture C. purchase D. produce
3. A .decreased B. lessened C. multiplied D. increased
4. A .reduced B. diminished C. enlarged D. shorten
5. A .Since B. Additionally C. Therefore D. However
6. A .alternative B. opposite C. direct D. indirect
7. A .necessary B. significantly C. obligatory D. essentially
8. A .Consequently B. Therefore C. Hence D. Therein
9. A .minimization B. shortage C. limitations D. restrictions
10. A .broad B. wide C. deep D. long

Writing

Imagine that you are going to take part in the conference. Write an e-mail to your colleague. (100 words)

1. Ask 5 questions on the topic **Lasers**.

2. Develop the topic **Lasers. Advantages and Disadvantages.**

Unit 2

Read and memorize the following words:

- artificial – искусственный
- application – применение, использование
- consistent – последовательный, согласующийся
- sine wave – синусоидальная волна
- adjust - регулировать
- to be of importance – иметь важное значение
- permeability – магнитная проницаемость
- permittivity – диэлектрическая проницаемость

Reading

1. Make one text putting the paragraphs A-E into the correct order from 1-5.

Radio wave

A. The wavelength is the distance from one peak of magnetic flux to the next, and is inversely proportional to the frequency. The distance a radio wave travels in one second, in a vacuum is 300 000 000 meters which is the wavelength of a 1 hertz radio signal. A 1 megahertz radio signal has a wavelength of 299.8 meters.
B. Radio waves were first predicted by mathematical work done in1867 by James Clerk Maxwell. He noticed wave like properties of light and similarities in electrical and magnetic observations. He then proposed equations that described light waves and radio waves as waves of electromagnetism that travel in space, radiated by a charged particle as it undergoes acceleration. In 1887, Heinrich Hertz demonstrated the reality of Maxwell's electromagnetic waves by experimentally generating radio waves in his laboratory. Many inventions followed, making the use of radio waves to transfer information through space.
C. Radio waves are a type of electromagnetic radiation with wavelengths in the electromagnetic spectrum longer than infrared light. Radio waves have frequencies from 300 GHz to as low as 3 kHz, and corresponding wavelengths ranging from 1 millimeter to 100 kilometers. Like all other electromagnetic waves, they travel at the speed of light. Naturally occurring radio waves are made by lightning, or by astronomical objects.

Artificially generated radio waves are used for fixed and mobile radio communication, broadcasting, radar and other navigation systems, communication satellites, computer networks and innumerable other applications. Different frequencies of radio waves have different propagation characteristics in the Earth's atmosphere; long waves may cover a part of the Earth very consistently, shorter waves can reflect of the ionosphere and travel around the world, and much shorter wavelengths bend or reflect very little and travel on a line of sight.

D. In order to receive radio signals, for instance from AM/FM radio stations, a radio antenna must be used. However, since the antenna will pick up thousands of radio signals at a time, a radio tuner is necessary to tune into a particular frequency (or frequency range). This is typically done via a resonator (in its simplest form, a circuit with a capacitor and an inductor). The resonator is configured to resonate at a particular frequency (or a frequency band), thus amplifying sine waves at that radio frequency, while ignoring other sine waves. Usually, either the inductor or the capacitor of the resonator is adjustable, allowing the user to change the frequency at which it resonates.

E. The study of electromagnetic phenomena such as reflection, refraction, polarization, diffraction, and absorption is of critical importance in the study of how radio waves move in free space and over the surface of the Earth. Different frequencies experience different combinations of these phenomena in the Earth's atmosphere, making certain radio bands more useful for specific purposes than others. Radio waves travel at the speed of light in a vacuum. If radio waves strike an electrically conductive object of any size, they are slowed according to the object's permeability and permittivity.

A	B	C	D	E

2. Read the text. For items 1-7 match the ending of each sentence A-F to its beginning. There is one extra ending you do not need to use.

In circuits carrying alternating currents, particularly high frequency currents, the power loss is often greater than where a direct current of the same value is being carried. This is because of many factors **A**_____. As a result, it is

customary, in dealing with alternating current circuits, to consider that this effective or equivalent circuit resistance is that quantity **B _____.**

Skin effect. At high frequencies the current carried by a conductor is not uniformly distributed over the conductor cross section, **C _____**, but rather tends to be concentrated near the surface. This action is **D _____**. Those parts of the cross section which are circled by the largest number of flux lines have higher inductance than other parts of the conductor, **E _____**. The result is a redistribution of current over the cross section in such a way as to cause those parts of the conductor having the higher resistance, **F _____**. With a round wire this causes the current density to be maximum at the surface and least at the center. With a square bar the greatest concentration of current is at the corners, with the flat sides coming next and the center carrying the least current.

1. and hence a greater reactance;
2. a result of magnetic flux lines that circle part but not the entire conductor;
3. as in the case with direct currents;
4. with the resistance of such a cell;
5. which when manipulated by the square of the current equals the power dissipated in the circuit;
6. i.e., those parts nearer the center, to carry the least current;
7. as dielectric hysteresis, eddy currents, skin effect, etc.

A	B	C	D	E	F

3. For questions 1-10 read the text and decide whether the information in the sentences is Right or Wrong. Write the correct letter (R/W).

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will be now described herein with reference to illustrative embodiments. Those skilled in the art will recognize that many alternative embodiments can be accomplished using the teachings of the present invention and that the invention is not limited to the embodiments illustrated for explanatory purposes.

Hereunder is a description of embodiments of the present invention with reference to the drawings.

FIG. 1 is a block diagram showing a configuration of a radio wave propagation characteristic estimation apparatus 1 according to an embodiment of the present invention. In FIG. 1, the radio wave propagation characteristic estimation apparatus 1 includes: an input section 2; a building database 3; a plan view data generation section 4; a vertical cross-sectional view data generation section 5; a ray launching method calculation section 6; an imaging method calculation section 7; a synthesis section 8; and an output section 9.

The input section 2 is for the operator to specify estimation conditions of a characteristic related to propagation of a radio wave (a radio wave propagation characteristic). The operator uses the input section 2 to specify a target zone for estimating a radio wave propagation characteristic (a specified zone), a transmission point of a radio wave (a radio wave transmission point), and a reception point of a radio wave (a radio wave reception point).

The building database 3 has information on the shapes, heights, orientations, and locations of the buildings. The building database 3 is configured so as to store at least information on the buildings that really exist in the specified zone. For example, in the building database 3, information on the buildings really existing in the zone whose radio wave propagation characteristic is estimated by the radio wave propagation characteristic estimation apparatus 1 is previously included as much as possible. Alternatively, the building database 3 may be configured so as to obtain and store, according to a specified zone, information on the buildings existing in the zone from a building database provided outside the radio wave propagation characteristic estimation apparatus 1.

The plan view data generation section 4 reads information on the buildings in the specified zone from the building database 3, and uses the information on the buildings to generate plan view data. The vertical cross-sectional view data generation section 5 reads information on the buildings in the specified zone from the building database, and uses the information on the buildings to generate vertical cross-sectional view data.

The ray launching method calculation section 6 uses the plan view data to calculate a first piece of radio wave propagation characteristic estimation data in which a radio wave propagation characteristic from the radio wave transmission point to the building with the radio wave reception point is estimated by the ray launching method. The imaging method calculation section 7 uses the vertical cross-sectional view data to calculate a second piece of radio wave propagation characteristic estimation data in which a radio wave propagation characteristic from the radio wave transmission point to the building with the radio wave reception point is estimated by the imaging method.

The radio wave propagation characteristic estimation data includes a trace of a radio wave, a propagation loss, signal intensity receive.

The synthesis section 8 calculates pieces of indoor penetration data to the radio wave reception point within the building respectively for the first piece of radio wave propagation characteristic estimation data and the second piece of radio wave propagation characteristic estimation data, and synthesizes the pieces of indoor penetration data. The output section 9 outputs the resultant radio wave propagation characteristic estimation data.

The radio wave propagation characteristic estimation apparatus 1 according to the present embodiment may be implemented by dedicated hardware. Alternatively, it may be constituted by a computer system such as a personal computer, and the function thereof may be implemented by executing a program for implementing the functions of the sections of the radio wave propagation characteristic estimation apparatus 1 shown in FIG. 1.

Furthermore, it is configured such that an input apparatus, an output apparatus, and the like are connected as peripheral equipment to the radio wave propagation characteristic estimation apparatus 1. Here, the input apparatus refers to an input device such as a keyboard and a mouse, a readout apparatus that reads data from a recording medium, and the like. The output apparatuses include, for example, a display apparatus such as a CRT (Cathode Ray Tube) and a liquid crystal display

1. Embodiments describe the present invention with reference to the flow charts.

2. In FIG. 1, the radio wave propagation characteristic estimation apparatus 1 includes several calculation methods and data generation sections.
3. The operator uses the input section 2 to specify a target zone for estimating a radio wave propagation characteristic (a randomly chosen zone).
4. The building database 3 is configured so as to store at full information on the buildings that really exist in the specified zone
5. The building database 3 may be configured so as to output and apply, according to a specified zone, information on the buildings.
6. The plan view data generation section 4 records data on the buildings in the specified zone from the building database 3
7. The imaging method calculation section 7 uses the vertical cross-sectional view data to calculate a third piece of radio wave propagation characteristic estimation data
8. Section 8 calculates pieces of indoor penetration data to the radio wave reception point excluding the building.
9. Apparatus 1or a computer system such as a personal computer may implement the radio wave propagation characteristic estimation.
10. The output apparatuses include, for example, a display apparatus such as a Cathode Ray Tube and a liquid crystal display.

Grammar and Word Formation

1. Open the brackets. Put in the correct verb form.

When Heinrich Hertz **1._____(undertake)** his experiments to verify that radio waves were electromagnetic radiation which behaved as expected from the theory developed by Maxwell, he probably used frequencies between 50 and 500 MHz.

He **2._____(selected)** frequency by adjusting the size of the radiation structure, and chose it so that he **3. _____ (can)** observe the propagation effects of reflection and refraction within his laboratory.

The first public demonstration of a community system by Oliver Lodge also probably used a frequency in the VHF range and signals **4. _____(propagate)** about 60 min to the lecture hall.

Marconi and others took up this idea and Marconi in particular, by increasing the size of the antennas, **5._____ (reduce)** the frequency and was able to exploit the better long-distance propagation properties at progressively lower frequencies.

Since the beginning it **6._____ (be)**the practical use of the propagation of electromagnetic waves over long distances, together with the ability to modulate the waves and thus transfer information, which **7._____ (provide)** the opportunity for the development of radio and electronic technologies.

This, in turn, **8._____(drive)** a need to extend knowledge of the propagation environment and to characterize the transfer function of the radio channel to provide greater communication bandwidths and greater quality of service.

Propagation in free space, or in a uniform dielectric medium, may be described simply. It **9._____(be)** the effect of the earth and its surrounding environment which **10._____(lead)** to variability and distortion of the radio signal, and which provides the challenge for the propagation engineer.

He seeks to provide a detailed description of the signal and a prediction capability for use in the design, planning and operation of radio systems.

2. Insert the correct word form.

The purpose of this paper is to describe a method of _____ ***(reduction)*** electromagnetic scattering problems to a series of problems in potential theory. We consider a general class of three-dimensional scatters: smooth, closed, bounded, in short those surfaces for which Green's theorem may be invoked. The solution of a scattering problem, for time _____ ***(harmony)*** but otherwise arbitrary excitation, is expressed as a series in _____ ***(ascend)*** powers of wave number, k. This series is known by a _____ ***(vary)*** of names including Rayleigh series, quasi-static series and low frequency expansion. That the first term in such a series could be found as the solution of a potential problem was observed by Rayleigh who determined this term explicitly for a variety of _____ ***(scatter)*** of both acoustic and electromagnetic waves.

The derivation of _____ ***(success)*** term in this series for electromagnetic scattering was described by Stevenson. _____***(Actual)*** Stevenson described two methods, one for finding the general term in the series and a second special technique for finding the first three terms. All of his specific_____**(calculate)** were carried out using this special technique. No attempt to utilize the general method for obtaining _____ ***(high)*** order terms has, to this _____ ***(writer)*** knowledge, been reported. This may be due to the fact the analysis is _____***(suffice)*** invoked to _____ ***(courage)*** any effort to derive more than

three terms in a low frequency _____ ***(expand)***. For these, special Stevenson's technique suffices.

3. Choose the necessary word.

Wall transmission

The algorithm for LOS beams can be extended to provide **1._____** non-line -of-sight information. This can include for instance the number of penetrated walls or material which can be **2. _____** by taking all walls into account that intersect the direct ray from its source to a receiver as sketched in Figure 7.

We first provide a more **3. _____** look at GPU frame buffer operations which are an integral part of the algorithm for transmission **4. _____** . When fragments are collected and **5._____** in the frame buffer at the final stage of the rendering pipeline, frame buffer operations decide how fragments that fall on the same pixel position, contribute to the final color of that pixel. **6. _____** , the fragment with the lowest depth value, i.e., which is nearest to the viewer, determines (replaces) the pixel color. **7. _____** , the final color can be a combination (interpolation) of both values of fragments, the one already in the frame buffer and the new one, which wants to occupy the same pixel position. This technique is called blending.

Blending has to be implemented by a user-written fragment program since high **8.** _____ blending is not yet directly supported in hardware.

We propose the following 8 bit **9. _____**and 32 bit fragment hybrid shade blending approach so as to **10. _____**the drawback support propagation environments with an arbitrary number of walls.

1. A .extra B. additional C. supplementary D. further
2. A .obtained B. reached C. got D. achieved
3. A .thorough B. accurate C. perfect D. detailed
4. A .thickness B. density C. depth D. center
5. A .fixed B. written C. recorded D. filed
6. A .Usually B. As a rule C. Commonly D. Mostly
7. A .Alternatively B. Oppositely C. Variably D. Directly
8. A .accuracy B. strictness C. precision D. exactness
9. A .apparatus B. hardware C. equipment D. software
10. A .work out B. outdo C. get rid D. overcome

Writing

Imagine that you are going to take part in the conference. Write an e-mail to your colleague. (100 words)

1. Ask 5 questions on the topic **Radio Waves**.

2. Develop the topic **Radio Waves and Application**.

Read the text “Radio wave” thoroughly and give detailed answers to the following questions:

- What distance does a radio wave cover to travel in one second in a vacuum?
- What observation did Maxwell make concerning radio waves?
- What experiments did Heinrich Hertz perform in the area of radio wave research?
- What is the radio wave range of frequencies?
- What is the common origin of natural radio waves?
- What can you say about propagation characteristics of different frequencies?
- What is radio antenna used for?
- What phenomena should be taken into consideration while studying radio waves?
- What does the propagation speed of radio waves depend on?

Unit 3

1. What are the main parts of electronic computers? Speak about this up – to - date equipment.

2. Read the following words:

a. with the **first** syllable stressed:
   Cause, memory, input, output, typewriter, similar, sequence, common.
b. with the **second** syllable stressed:
   Obey, communicate, internal, external, convert, exist, arise, machine, instruction, consist, perform, magnetic, control, result, equipment, electron
c. with the **third** syllable stressed:
   Fundamental, computation, calculation, intermediate, arithmetic, problematic

3. Give the Russian equivalents to the above mentioned words.

Reading

1. Make one text putting the paragraphs A-E into the correct order from 1-5.

Electronic computing machines

A. There are many different types of codes used on existing machines Inside the machine the numbers and instructions are stored as electronic pulses, small magnetic dipoles in magnetic materials or in some similar manner. A problem must be fed into the machine.
B. All the electronic computers consist of five main parts.
   The first part is an arithmetic unit which is capable of performing the fundamental arithmetic operations at a very high speed.
C. The next part of the computer is the store or memory, which holds the numbers which form the initial data or arise at the intermediate stages of a computation.
   Control unit. This takes the coded instructions in the correct sequence and causes them to be obeyed.
D. The last but not the least is the unit which does this and it is called the input. In most existing machines the input consists of a reader which will convert information which is punched either on cards or on paper tape into the pulse form with which the machine operates internally.

E. An output unit by means of which final answers, and sometimes intermediate results, are communicated to the outside world. The most common forms of output are punched card or punched tape equipment and electrically-operated typewriters.

A	B	C	D	E

2. Read the text. For items 1-7 match the ending of each sentence A-F to its beginning.

Modern cash registers

Cash register is a machine that records the amount of a sale. Modern cash registers may:

- Calculates the total sale when a customer purchases several items;
- Maintains a record of each sale and the department in which it was made;
- Records whether the sale was paid for by cash or is to be charged;
- Prints the details of the sale on a sales check **A**_____;
- Keep track of sales tax and can calculate the change due to a customer.

Modern cash registers may be connected to handheld or stationary bar code readers. It could be more rapidly got purchases scanned than **B**_____.

Registers typically use thermal printers so that **C** _____ and alternatively in order **D**_____ so as the larger retailers could identify the transactions with the unique barcodes.

Manual items like fruit identifying and placing them into a bagging area.

Normally, an employee watches over several preventive thefts or **E**_____. These are accepted by debit or credit cards or cash via coin slot and bank note scanner.

A store login is entered only when **F**_____.

1. and across a tube remains former;
2. they print receipts;

3. which is given to the customer as a receipt;
4. would be possible by keying numbers into the register by hand;
5. to facilitate returns or other customer services;
6. intentional expensive produce and dry goods misidentification checkouts;
7. alcohol and solvents are purchased

A	B	C	D	E	F

3. For questions 1-10 read the text and decide whether the information in the sentences is RIGHT or Wrong. Write the correct letter (R/W).

Taximeters

Electric battery-powered taxis became available at the end of the 19th century. In London, Walter C. Bersey designed a fleet of such cabs and introduced them to the streets of London in 1897. They were soon nicknamed 'Hummingbirds' due to the idiosyncratic humming noise they made. In the same year in New York City, the Samuel's Electric Carriage and Wagon Company began running 12 electric hansom cabs. The company ran until 1898 with up to 62 cabs operating until it was reformed by its financiers to form the Electric Vehicle Company.

The modern taximeter was invented by German inventor Friedrich Wilhelm Gustav Bruhn and the Daimler Victoria—the world's first meter-equipped (and gasoline-powered) taxicab—was built by Gottlieb Daimler in 1897 and began operating in Stuttgart in 1897. Gasoline-powered taxicabs began operating in Paris in 1899, in London in 1903, and in New York in 1907. The New York taxicabs were imported from France by Harry N. Allen who decided to paint his taxicabs yellow so as to maximize his vehicles' visibility.

Taxicabs proliferated around the world in the early 20th century. The first major innovation after the invention of the taximeter occurred in the late 1940s, when two-way radios first appeared in taxicabs. Radios enabled taxicabs and dispatch offices to communicate and serve customers more efficiently than previous methods, such as using call boxes. The next major innovation occurred in the 1980s, when computer assisted dispatching was first introduced

1. Battery-powered taxis became available at the end of the 18th century.
2. Later on in New York City, the Samuel's Electric Carriage and Wagon Company began running 12 electric hansom cabs.
3. The company ran until 1898 and then it was closed by its financiers.

4. The world's first meter-equipped taxicab—began operating in Germany in 1897.
5. Gasoline-powered taxicabs began operating in France in 1899, in UK in 1903, and in the USA in 1907.
6. The New York taxicabs were imported from the UK.
7. Harry N. Allen decided to paint his taxicabs yellow so as to maximize his vehicles' popularity.
8. The first major innovation meant two-way radios.
9. Call boxes were already ineffective.
10. In the 1970s computer assisted dispatching was first introduced.

Grammar and Word Formation

1. Open the brackets. Put in the correct verb form.

As interpreted today, integrate-and-fire models **1._____(not restrict)** to the linear membrane properties of simple capacitor-resistor circuit. It is possible to include accurately modeled synaptic and sub threshold conductances in such a model. The utility of the integrate-and-fire model **2._____(lie)** in the separation of time scales between the extremely rapid action potential and **3._____(slow)** process that affect synaptic integration, bursting and adaptation. While Lapicque, because of the limited knowledge of his time, **4._____(have)** no choice but to model the action potential in a simple manner, the stereotypical character of action potentials **5._____(allow)** us, even today, to use the same approximation to avoid computation of the voltage trajectory during an action potential. This **6._____(allow)** us to focus both intellectual and computation resources on the issues likely to be more relevant in neural computation, without **7._____(expand)** time and energy on modeling a phenomenon, the generation of action potentials, that already well **8._____(understand)**.

Integrate models **9._____(use)** in a wide variety of studies ranging from investigations of synaptic integration by single neurons to simulations of networks containing hundreds of thousands of neurons. The model **10._____ (prove)** particularly useful in such networks.

2. Insert the correct word form.

Nanocrystals

Examples: "Metal nanocrystals might be incorporated into car bumpers, _____***(make)*** the parts stronger, or into aluminum, making it more wear

resistant. Metal nanocrystals might be used to produce bearings that last longer than their conventional counterparts, new types of sensors and components for computers and electronic hardware.

Nanocrystals of various metals _____***(be show)*** to be 100 percent, 200 percent and even as much as 300 percent _____***(hard)*** than the same materials in bulk form. Because wear resistance often _____***(dictate)*** by the hardness of a metal, parts _____***(make)*** from nanocrystals might last significantly longer than conventional parts."

Nanocrystals absorb then re-emit the light in a different color -- the size of the nanocrystal (in the Angstrom scale) determines the color.

Six different quantum dot solutions _____***(show)***, excited with a long-wave UV lamp.

Quantum dots are molecular-scale optical beacons. Qdot™ nanocrystals behave like molecular LEDs (light emitting diodes) by "lighting up" biological _____***(bind)*** events with a broad palette of applied colors.

Smith & Nephew markets an antimicrobial dressing covered with nanocrystalline silver (A patented Technology of NUCRYST Pharmaceuticals). The nanocrystalline coating of silver rapidly _____***(kill)*** a broad spectrum of bacteria in as little as 30 minutes.

"Nanocrystals _____***(be)*** an ideal light harvester in photovoltaic devices. They absorb sunlight more strongly than dye molecules or bulk semiconductor material, therefore high optical densities can be achieved while _____***(maintain)*** the requirement of thin films. Perfectly crystalline CdSe nanocrystals are also an artificial reaction center, _____***(separate)*** the electron hole pair on a femtosecond timescale. Fluorescent nanocrystals have several advantages over organic dye molecules as fluorescent markers in biology. They are incredibly bright and _____***(not photo degrade)***. Drug-conjugated nanocrystals attach to the protein in an extracellular fashion, enabling movies of protein trafficking. They also form the basis of a high-throughput fluorescence assay for drug discovery."

3. Choose the necessary word.

Single-walled carbon nanotubes can be either semiconductors or metals; two independent terms have now **1.**_____demonstrated. **2.**_____ nanotubes were discovered in 1990, theorists **3.**_____ that these seamless rolled –up

sheets of carbon hexagons could be either metals or semiconductors, **4._____** the tube diameter and the helicity-related to the corkscrew –like angle at which the **5._____**carbon sheets are rolled. Using scanning tunneling microscopes (STM's), a team from Delft University of Technology and Rice University and **6._____**, a Harvard group have **7._____** the relation between tube morphology and conductance, by relating atom-scale images of the nanotubes to tunneling-current measurements of the electron density of states. An **8._____** finding from the STM images was that nanotubes exist with a **9._____**range of helicities, not just wrapped at preferential angles, as **10._____**thought.

1. A .ultimately B. conclusively C. definitively D. continuously
2. A .Afterwards B. Later on C. Shortly after D. Subsequently
3. A .predicted B. forecasted C. foretold D. estimated
4. A .relied on B. expected C. counted upon D. depending on
5. A .even B. smooth C. plane D. flat
6. A .singly B. separately C. aside D. apart
7. A .support B. maintained C. confirmed D. affirmed
8. A .surprising B. unforeseen C. hoped D. unexpected
9. A .large B. vast C. wide D. extensive
10. A .preliminary B. previously C. in advance D. beforehand

Writing

Imagine that you are going to take part in the conference. Write an e-mail to your colleague. (100 words)

1. Ask 5 questions on the topic **Electronic and Mechanical Devices**.

2. Develop the topic **Electronic and Mechanical Devices Application**

Unit 4

Key-Terms Study

The data below present the most important trends in Radio Physics Study. Once getting acquainted, you'll make a life choice.

Interpret the underlined English terms in the following way via New Technologies routes:

Radiometry- is a set of techniques for measuring electromagnetic radiation, including visible light. Radiometric techniques characterize the distribution of the radiation's power in space, as opposed to photometric techniques, which characterize the light's interaction with the human eye.

- ***Radio Engineering department*** (1945) (p.25 "Radiophysics Faculty & I Am A Radiophysicist") main interests are electromagnetic compatibility of radio electronic devices, millimeter wavelength radiometry in applications to medicine and ecology, processing of non-stationary signals, computer-aided design and optimization of radio electronics equipment, and thermographs as applied to medicine and engineering.
- ***Electro Dynamics Department*** (1945) (p.26) main interests are interaction of powerful electromagnetic waves with plasmas, nonlinear optics, propagation and diffraction of electromagnetic waves, wireless communication systems.
- ***Electronics Department*** (1953) (p.27) main interests are studies of cyclotron resonance masers, free electron lasers, and CW gyrators for technological applications. Solid-state electronics and intensive non stationary microwave spectroscopy and processes modeling in millimeter and sub milliliter semiconductor devices research area.
- ***Electromagnetic Waves Propagation and Radio Astronomy Department*** (1945) (p.28) main interests are theory of electromagnetic wave radiation, antenna theory, theory of wave propagation in random media, nonlinear phenomena in the ionosphere illuminated by powerful radio waves.
- ***Oscillations Theory and Automatics Regulation Department*** (1945) (p.28) main interests are nonlinear oscillations and waves, dynamical chaos,

stochastic synchronization and applications of the results in chemistry, biology (particularly in neuroscience) and economics.

- ***General Physics Department*** (1947) (p.32) main interests are non linear optics of photopolymers, optical 3D technologies, and the theory of electromagnetic waves in time-varying media.
- ***Acoustics (in continuous media) Department*** (1948) (p.33) main interests are experimental and theoretical modeling of sound propagation in ocean waveguides, including ocean acoustic tomography, propagation of sound through bubble-field media, experimental and theoretical study of the parametric arrays.
- ***Bionics and Statistical Radio Physics Department*** (1963) (p.34) main interests are physics of fluctuations and noise phenomena, adaptive antenna arrays, space-time signal processing in modern wireless communication systems, digital signal processing and noise analysis.
- ***Mathematics Department*** (1961) (p.36) main interests are numerical methods in integer differential and inverse problems, wave processes in mechanics as applied to industry, and statistical analysis of random fields and diffusion processes.
- ***Computer Systems and Information Technologies*** (p.37) main interests are telecommunication technology, information technology (including information security, cryptography, open keys infrastructure, digital signature technologies and information security in telecommunications), computer and network security.
- ***Nanostructures and Electronics Department*** (2004) (p.39) main interests are surface physics, solid-state nanostructures, high-temperature semiconductors and soft X-ray optics, as well as technologies and applications of thin films, surface and multi-layer structures as trends in modern condensed media physics
- ***Neuron Dynamics and Neurobiology*** (2005) main interests are cellular neurophysiology (co foci and multi photon fluorescent microscopy, patch-clamp electrophysiology, multi electrode recordings of living brain slices and neuronal culture), modeling of brain cells, neural network dynamics and the dynamics of functional systems in the brain.

Translate from Russian into English:

1. Центр осуществляет подготовку специалистов по специальности "Информационная безопасность телекоммуникационных систем", готовит магистров по направлению "Фундаментальная информатика и информационные технологии".
2. Учебная деятельность в центре осуществляется на базе лабораторий "ЭВМ" и "Средства коммуникаций и безопасность информационных систем".
3. Кафедра имеет научные связи с ведущими академическими и отраслевыми институтами Российской Федерации.
4. Кафедра обеспечивает чтение курсов по электродинамике, ведет специализацию «Физика волновых процессов» (электродинамика и физика плазмы; электродинамика СВЧ систем, когерентная и нелинейная оптика), готовит бакалавров и магистров по направлению «Электромагнитные волны в средах».
5. Кафедра обеспечивает на факультете цикл подготовки, закладывающий у студентов основы квантовой культуры: общие курсы лекций и упражнения по квантовой механике и квантовой радиофизике, лабораторные работы по лазерной и микроволновой спектроскопии, физике лазеров и нелинейной оптике.
6. Для старшекурсников, магистров и аспирантов на кафедре читаются специальные курсы по современным методам квантовой теории и приложениям.
7. Здесь были выполнены фундаментальные работы по нелинейной оптике, по теории шумов в квантовых генераторах, установлены нелинейные флуктуационно- диссипативные соотношения.
8. Была написана книга "Квантовая радиофизика", которая является всемирно известным руководством по квантовой электронике.
9. Кафедра обеспечивает общие лекционные курсы по физической электронике и электронным приборам, ведет специализацию студентов старших курсов и подготовку магистров по направлениям: «СВЧ-электроника больших мощностей», «Численное моделирование сверхмощных СВЧ-источников электромагнитного излучения», «Твердотельная электроника», «Физика сверхпроводимости», «Моделирование электронных процессов в полупроводниковых приборах», «Микроволновая спектроскопия»

10. Непосредственный контакт между студентами и научными работниками обеспечивает подготовку на современном мировом уровне
11. Традиционными на кафедре и ее филиале в ИПФ РАН являются экспериментальные и теоретические исследования мазеров на циклотронном резонансе, лазеров на свободных электронах, гиротронов непрерывного действия для технологических целей.
12. Пособие содержит описание математической модели спинового генератора на основе уравнений Ландау-Лифшица с дополнительным слагаемым, введенным Слончевским.
13. Предлагается лабораторная работа, посвященная исследованию нелинейной динамики рассматриваемой модели, а также изучению свойств спиновых генераторов.
14. Работа выполняется на компьютере с помощью готовой программы.
15. Изучается явление вынужденной синхронизации.
16. Рассмотрена динамика моделей лампового генератора в мягком и жестком режиме возбуждения при внешнем гармоническом воздействии.
17. Исследование проведено методами теории колебаний и компьютерного моделирования.
18. Результаты представлены в виде параметрических и фазовых портретов, однопараметрических бифуркационных диаграмм.
19. Приводятся описание лабораторной установки и задания по экспериментальному исследованию явления вынужденной синхронизации.
20. Кроме тесных связей с ИПФ РАН, НИРФИ, кафедра поддерживает научные контакты с кафедрой акустики Московского университета, университетом Болоньи (Италия), Стокгольмским техническим университетом (Швеция), обсерваторией Ниццы (Франция)

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