ДОНСКОЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

УПРАВЛЕНИЕ ДИСТАНЦИОННОГО ОБУЧЕНИЯ И ПОВЫШЕНИЯ КВАЛИФИКАЦИИ

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«Иностранный язык в профессиональной сфере»

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Аннотация

Данное учебное пособие предназначено для студентов направления 12.03.01 «Приборостроение», изучающих английский язык.

Цель пособия – познакомить студентов с базовой профессиональной терминологией, закрепить навыки чтения и перевода, развить навыки реферирования и аннотирования специальных текстов на английском языке. Текстовый материал пособия аутентичен и подобран в соответствии с темами и уровнем сложности.

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Оглавление

UNIT 1

Text 1. Instrumentation engineering

Vocabulary:

instrumentation engineering – приборостроение
domain – область, сфера
reliability – надежность
accuracy – точность
longevity- долговечность
robustness- прочность
capacity- вместимость
techniques- техника, методы
troubleshooting- выявление неисправностей
measure- мера, измерение; измерять
device- прибор, устройство
solenoid- соленоид
valve- клапан
circuit breaker- автоматический выключатель, прерыватель

Ex.1 Read and translate the following text.

Instrumentation engineering is the engineering specialization focused on the principle and operation of measuring instruments that are used in design and configuration of automated systems in electrical, pneumatic domains etc. They typically work for industries with automated processes, such as chemical or manufacturing plants, with the goal of improving system productivity, reliability, safety, optimization, and stability. To control the parameters in a process or in a particular system, devices such as microprocessors, microcontrollers or PLCs are used, but their ultimate aim is to control the parameters of a system. Instrumentation is the use of measuring instruments to monitor and control a process. It is the art and science of measurement and control of process variables within a production, laboratory, or manufacturing area.

Instrumentation engineering is loosely defined because the required tasks are very domain dependent. An expert in the biomedical instrumentation of laboratory rats has very different concerns than the expert in rocket instrumentation. Common concerns of both are the selection of appropriate sensors based on size, weight, cost, reliability, accuracy, longevity, environmental robustness and frequency response. Some sensors are literally fired in artillery shells. Others sense thermonuclear explosions until destroyed. Invariably sensor data must be recorded, transmitted or displayed. Recording rates and capacities vary enormously. Transmission can be trivial or can be clandestine, encrypted and low-power in the presence of jamming. Displays can be trivially simple or can require consultation with human factors experts. Control system design varies from trivial to a separate specialty.

Instrumentation engineers are commonly responsible for integrating the sensors with the recorders, transmitters, displays or control systems. They may design or specify installation, wiring and signal conditioning. They may be responsible for calibration, testing and maintenance of the system.

In a research environment it is common for subject matter experts to have substantial instrumentation system expertise. An astronomer knows the structure of the universe and a great deal about telescopes - optics, pointing and cameras (or other sensing elements). That often includes the hard-won knowledge of the operational procedures that provide the best results. For example, an astronomer is often knowledgeable of techniques to minimize temperature gradients that cause air turbulence within the telescope.

Instrumentation technologists, technicians and mechanics specialize in troubleshooting and repairing and maintenance of instruments and instrumentation systems.

An instrument is a device that measures a physical quantity such as flow, temperature, level, distance, angle, or pressure. Instruments may be as simple as direct reading thermometers or may be complex multi-variable process analyzers. Instruments are often part of a control system in refineries, factories, and vehicles. The control of processes is one of the main branches of applied instrumentation. Instrumentation can also refer to handheld devices that measure some desired variable. Diverse handheld instrumentation is common in laboratories, but can be found in the household as well. For example, a smoke detector is a common instrument found in most western homes.

Instruments attached to a control system may provide signals used to operate solenoids, valves, regulators, circuit breakers, or relays. These devices control a desired output variable, and provide either remote or automated control capabilities. These are often referred to as final control elements when controlled remotely or by a control system.

Ex.2 Match the words of group A with the words of group B having similar meaning.

A. concentrate, manufacturing, register, work, demand, application, goal, instrument, structure, break

B. production, use, focus, destroy, device, record, aim, operation, design, require

Ex.3 Complete the following sentences with the information from the text.

1. Instrumentation engineering is loosely defined because … .
2. Instrumentation engineers are responsible for… .
3. An instrument is a device that… .
4. Instrumentation technologists, technicians and mechanics specialize in …. .

Ex.5 Answer the questions.

1. How can instrumentation engineering be defined?
2. What spheres of industry do instrumentation engineers work?
3. What functions do they perform?
4. Do technologists, technicians and mechanics design instruments?
5. What quantities/ parameters can modern instruments measure?

Text 2. Instrumentation in Russia

Vocabulary:

weigh-scales -весы
enterprise - предприятие
concern - концерн
avionics – авиационная радиоэлектроника
warfare and intelligence equipment – военно-разведывательное оборудование
friend-or-foe – система «свой-чужой»
plug – затвор, цилиндр
supplier -поставщик
arms - вооружение
means – средства

Ex.1 Read and translate the following text.

In Russia instrument engineering is the branch of machine-building industry that develops and manufactures devices for measurement, processing and providing information, automatic and automated control systems.

It was not until 1929 that instrument engineering began its development as there were only several small factories producing thermometers, manometers, weigh-scales and other measuring instruments. The process of industrialization boosted the industrial development of this branch in 1929-1932.

Nowadays Russian instrument building plants present one of the most productive branches of modern industry experiencing the stage of active growth and comprising more than 30 enterprises. The largest ones are located in Barnaul, Novosibirsk, Krasnodar and Moscow.

For example, Concern Radio-Electronic Technologies (KRET) is the major Russian center of word-class instrument engineering. It is a subsidiary of the state corporation Rostec. Presently, KRET unites more than 95 enterprises and organizations engaged in the development and production of military and civil radio-electronic products. The enterprises of the Concern are located across Russia, from Saint Petersburg to Vladivostok, and the total number of employees exceeds 50,000 people.

Currently, KRET produces a wide range of products, which may be classified as follows:

- avionics, operational and tactical systems;
- electronic warfare and intelligence equipment (EW and ELINT);
- friend-or-foe identification systems and equipment (IFF);
- special measuring instrumentation (MI);
- plugs, electric connectors, and cable products.

A significant share of the Concern's revenues comes from avionics and operational systems. KRET controls approximately 40% of the military avionics market. The Concern is developing avionics for the leading Russian aircraft, including Su-35S, Ka-52 Alligator, Mi-171A2, Yak-130, Il-476, and Tu-204SM, the most modern Russian line aircraft, as well as the Soyuz-TMA spacecraft. Thus, KRET is a supplier for the major Russian aircraft producers, such as United Aircraft Corporation and Russian Helicopters. Currently, the enterprises of the Concern are among the world leaders and the top Russian designers and producers in the field of electronic warfare equipment and suites, as well as IFF systems, which have no foreign equivalents. KRET is the designer of one of two IFF radar systems that exist in the world, Parol, which is used by Russia and the CIS countries (the second MK-12 radar IFF system is used by the USA and NATO members).

A notable trend in the business of the Concern is the significant increase in production of military electric connecters and cables, as well as the extension of the range of civil products. One of the goals of the Concern is to enter the world market of the plug connecter suppliers for major international companies, and particularly for Airbus.

High-tech products of KRET enterprises are available within the framework of the state arms program and state defense order, as well as international treaties in the field of military and technical cooperation. Even today, the products of the Concern are supplied to 30 countries of the world.

A significant amount of scientific production centers specializing in inventing radio-electronic production has entered into the activities transferred to the state corporation Rostec founded in 2007. It was decided to unite them within the framework of a holding company: concern.

In January 2009 an order was issued by the state corporation Rostec on the founding of JSC Concern Radioelectronic Technologies, in which a list of companies and organizations transferable to join the concern of companies and organizations of Russia's radio-electronic branch. A month later, on February 19, 2009, JSC Concern Radio-Electronic Technologies (KRET) was registered. This date is considered the company's founding date.

Over fifty companies initially joined the Concern, on the base of which primary new holding jurisdictions were formed:

- Technical complex developers and producers of the radio-technologic opposition entered into the group of companies along the time of the radio-electronic fight. The main production company OJSC Research-Production Enterprise Kvant was the head production company and JSC Kaluzhsky Scientific Research Radio-Technical Institute the leading scientific research organization;
- State radiolocation identification means and complexes developers and producers entered into the group of companies working in the sphere of state identification. JSC NPO V.I. Shimko Radioelectronics was the head organization;
- The integration of devel- opers and producers of electric

adapters and special function cable assemblies entered within the framework of the Cables and Adapters movement. A number of companies entered into this unit, amongst which JSC Zavod Elecon and JSC Design Bureau of the Cable Industry, two of Russia's biggest special electric adapter and cable development and production companies, stand out.

A group of diagnostic control system and special measuring apparatus developer companies and producers was also formed. Among others JSC Federal Scientific Production Center Institute of Electronic Measurements Kvarz, one of the biggest centers in Russia on special radio-electric measuring apparatus development and production, joined it.

The Concern's successes in forming a modern model of an effective scientific production structure have been recognized by the Russian government. At the end of 2012 by decision of Rostec's observation council a new direction of activity was added to the already existing production range: the development and production of board radio-electronic hardware and avionics for military, transport, and civil aviation. Companies, which were previously members of JSC Concern Aviapriborostroenie, were transferred to under KRET's leadership.

Even today KRET is one of the biggest holding companies in Russia, which unites over 95 radio-electronic industrial companies. Their activity is connected with the development and production of a means of radio-electronic battle and development, state identification, board radio-electronic equipment complexes and systems, special function measuring apparatuses, and also electric adapter plugs and cable production.

Ex.2 Find the Russian equivalents for the following phrases.

1. machine-building industry
2. automated control systems
3. radio-electronic products
4. operational and tactical systems
5. board radio-electronic hardware
6. civil aviation
7. measuring apparatus developer
8. a notable trend

Ex.3 Give the summary of Text 2.

UNIT 2 MEASUREMENTS AND MEASURING INSTRUMENTS

Text 1 Measurements

Vocabulary:

dimension- величина, объем
uncertainty- неточность
wavelength- длина волны
precision - точность
error - ошибка
stopwatch – секундомер

Ex.1 Read and translate the following text.

Measurement is the assignment of numbers to objects or events. It is a cornerstone of most natural sciences, technology, economics, and quantitative research in other social sciences.

Any measurement of an object can be judged by the following meta-measurement criteria values: level of measurement (which includes magnitude), dimensions (units), and uncertainty. They enable comparisons to be done between different measurements and reduce confusion. Even in cases of clear qualitative similarity or difference, increased precision through quantitative measurement is often preferred in order to aid in replication. For example, different colours may be operationalized based either on wavelengths of light or (qualitative) terms such as "green" and "blue" which are often interpreted differently by different people. The science of measurement is called metrology.

A **measuring instrument** is a device for measuring a physical quantity. In the physical sciences, quality assurance, and engineering measurement is the activity of obtaining and comparing physical quantities of real-world objects and events. Established standard objects and events are used as units, and the process of measurement gives a number relating the item under study and the referenced unit of measurement. Measuring instruments, and formal test methods which define the instrument's use, are the means by which these relations of numbers are obtained. All measuring instruments are subject to varying degrees of instrument error and measurement uncertainty.

Scientists, engineers and other humans use a vast range of instruments to perform their measurements. These instruments may range from simple objects such as rulers and stopwatches to electron microscopes and particle accelerators. Virtual instrumentation is widely used in the development of modern measuring instruments.

Ex.2 Match the word with its definition.

1.	error	• a. the state of being inaccurate, unsettled or in doubt or dependent on chance
2.	measurement	• b. a mistake, a wrong action attributable to bad judgment or ignorance or inattention
3.	metrology	c. the quality, condition, or fact of being exact and accurate
4.	uncertainty	d. the act or process of assigning numbers to phenomena according to a rule
5.	precision	e. the scientific study of measurement

Ex.3 Answer if the following statements are true or false. Correct the false ones.

1. Measurement is an important feature of most natural and social sciences.
2. Metrology is the science of measurement.
3. Measuring instruments do not have any degrees of instrument error and measurement uncertainty.
4. Scientists and engineers use only high- precision instruments like electron microscopes.
5. A measuring instrument is a device for measuring a physical quantity.

Text 2 Electronics and electrical engineering

Vocabulary:

electric charge – электрический заряд
electric current - электрический ток
transducer - преобразователь; датчик; приемник; первичный измерительный преобразователь
voltage - электрическое напряжение, разность потенциалов
magnetic flux - магнитный поток

electrical resistance and electrical conductance - электрическое сопротивление

inductance - индуктивность

capacitance - емкость; емкостное сопротивление

Ex.1 Read and translate the following text.

Considerations related to electric charge dominate electricity and electronics. Electrical charges interact via a field. That field is called electric if the charge doesn't move. If the charge moves, thus realizing an electric current, especially in an electrically neutral conductor, that field is called magnetic. Electricity can be given a quality — a potential. And electricity has a substance-like property, the electric charge. Energy (or power) in elementary electrodynamics is calculated by multiplying the potential by the amount of charge (or current) found at that potential: potential times charge (or current).

Electrical measurements are the methods, devices and calculations used to measure electrical quantities. Measurement of electrical quantities may be done to measure electrical parameters of a system. Using transducers, physical properties such as temperature, pressure, flow, force, and many others can be converted into electrical signals, which can then be conveniently measured and recorded. High-precision laboratory measurements of electrical quantities are used in experiments to determine fundamental physical properties such as the charge of the electron or the speed of light, and in the definition of the units for electrical measurements, with precision in some cases on the order of a few parts per million. Less precise measurements are required every day in industrial practice. Electrical measurements are a branch of the science of metrology.

Measurable independent and semi-independent electrical quantities comprise:

- Voltage
- Electric current
- Electrical resistance and electrical conductance
- Electrical reactance and susceptance
- Magnetic flux
- Electrical charge by the means of electrometer
- Magnetic field by the means of Hall sensor
- Electric field
- Electrical power by the means of electricity meter
- S-matrix by the means of network analyzer (electrical)

- Electrical power spectrum by the means of spectrum analyzer

Measurable dependent electrical quantities comprise:

- Inductance
- Capacitance
- Electrical impedance defined as vector sum of electrical resistance and electrical reactance
- Electrical admittance, the reciprocal of electrical impedance
- Phase between current and voltage and related power factor
- Electrical spectral density
- Electrical phase noise
- Electrical amplitude noise
- Transconductance
- Transimpedance
- Electrical power gain
- Voltage gain
- Current gain
- Frequency

Measuring instruments can be classified in various ways . One of them is based on measurement quantities. According to this principle measuring instruments are divided into:

- measuring instruments used to measure the electric current such as ammeters, voltmeters, multimeters, etc.;
- measuring instruments used to measure the pressure;
- measuring devices for measuring temperature;
- measuring instruments for measuring quantity, volume, condition of the substance.

Our special interest will be devoted to radio measuring instruments and devices such as the ammeter, oscilloscope, voltmeter, wattmeter, frequency meter, antennas and some others.

Ex.2 Answer the following questions.

1. What is the difference between a magnetic and an electric field?
2. How is energy calculated?
3. What do we understand under electrical measurements?
4. What measurements are applied in experiments to determine fundamental physical properties?
5. What electrical quantities do you know?
6. How can measuring instruments be classified ?

UNIT 3 OSCILLOSCOPE

VOCABULARY:
OSCILLOSCOPE (OSCILLOGRAPH) – ОСЦИЛЛОГРАФ
ADJUST – НАСТРАИВАТЬ, УСТАНАВЛИВАТЬ
EVENT – АКТ, ВОЛНА, ПРОЦЕСС
CATHODE RAY TUBE – КАТОДНАЯ ТРУБКА
STORAGE – ЗД. ЗАПОМИНАЮЩИЙ
DIGITIZER -АНАЛОГО-ЦИФРОВОЙ ПРЕОБРАЗОВАТЕЛЬ; ЦИФРАТОР

Text 1 Read and translate the following text.

OSCILLOSCOPE

An **oscilloscope**, previously called an oscillograph, and informally known as a **scope**, **CRO** (for cathode-ray oscilloscope), or **DSO** (for the more modern digital storage oscilloscope), is a type of electronic test instrument that allows observation of constantly varying signal voltages, usually as a two-dimensional plot of one or more signals as a function of time. Non-electrical signals (such as sound or vibration) can be converted to voltages and displayed.

Oscilloscopes are used to observe the change of an electrical signal over time, such that voltage and time describe a shape which is continuously graphed against a calibrated scale. The observed waveform can be analyzed for such properties as amplitude, frequency, rise time, time interval, distortion and others. Modern digital instruments may calculate and display these properties directly. Originally, calculation of these values required manually measuring the waveform against the scales built into the screen of the instrument.

The oscilloscope can be adjusted so that repetitive signals can be observed as a continuous shape on the screen. A storage oscilloscope allows single events to be captured by the instrument and displayed for a relatively long time, allowing human observation of events too fast to be directly perceptible.

Oscilloscopes are used in the sciences, medicine, engineering, and telecommunications industry. General-purpose instruments are used for maintenance of electronic equipment and laboratory work. Special-purpose oscilloscopes may be used for such purposes as analyzing an automotive ignition system or to display the waveform of the heartbeat as an electrocardiogram.

Before the advent of digital electronics, oscilloscopes used cathode ray tubes (CRTs) as their display element (hence were commonly referred to as CROs) and linear amplifiers for signal processing. Storage oscilloscopes used special storage CRTs to maintain a steady display of a single brief signal. CROs were later largely superseded by digital storage oscilloscopes (DSOs) with thin panel displays, fast analog-to-digital converters and digital signal processors. DSOs without integrated displays (sometimes known as digitisers) are available at lower cost and use a general-purpose digital computer to process and display waveforms.

Examples of use

One of the most frequent uses of scopes is troubleshooting malfunctioning electronic equipment. One of the advantages of a scope is that it can graphically show signals: where a voltmeter may show a totally unexpected voltage, a scope may reveal that the circuit is oscillating. In other cases the precise shape or timing of a pulse is important.

In a piece of electronic equipment, for example, the connections between stages (e.g. electronic mixers, electronic oscillators, amplifiers) may be 'probed' for the expected signal, using the scope as a simple signal tracer. If the expected signal is absent or incorrect, some preceding stage of the electronics is not operating correctly. Since most failures occur because of a single faulty component, each measurement can prove that half of the stages of a complex piece of equipment either work, or probably did not cause the fault.

Once the faulty stage is found, further probing can usually tell a skilled technician exactly which component has failed. Once the component is replaced, the unit can be restored to service, or at least the next fault can be isolated. This sort of troubleshooting is typical of radio and TV receivers, as well as audio amplifiers, but can apply to quite-different devices such as electronic motor drives.

Another use is to check newly designed circuitry. Very often a newly designed circuit will misbehave because of design errors, bad voltage levels, electrical noise etc. Digital electronics usually operate from a clock, so a dual-trace scope which shows both the clock signal and a test signal dependent upon the clock is useful. **Storage scopes** are helpful for "capturing" rare electronic events that cause defective operation.

Automotive use

First appearing in the 1970s for ignition system analysis, automotive oscilloscopes are becoming an important workshop tool for testing sensors and output signals on electronic engine management systems, braking and stability systems.

Types and models

Cathode-ray oscilloscope (CRO)

For analog television, an analog oscilloscope can be used as avectorscope to analyze complex signal properties, such as this display of SMPTE color bars.

The earliest and simplest type of oscilloscope consisted of a cathode ray tube, a vertical amplifier, a timebase, a horizontal amplifier and a power supply. These are now called "analog" scopes to distinguish them from the "digital" scopes that became common in the 1990s and 2000s.

Analog scopes do not necessarily include a calibrated reference grid for size measurement of waves, and they may not display waves in the traditional sense of a line segment sweeping from left to right. Instead, they could be used for signal analysis by feeding a reference signal into one axis and the signal to measure into the other axis. For an oscillating reference and measurement signal, this results in a complex looping pattern referred to as a Lissajous curve. The shape of the curve can be interpreted to identify properties of the measurement signal in relation to the reference signal, and is useful across a wide range of oscillation frequencies.

Dual-beam oscilloscope

The dual-beam analog oscilloscope can display two signals simultaneously. A special dual-beam CRT generates and deflects two separate beams. Although multi-trace analog oscilloscopes can simulate a dual-beam display with **chop** and **alternate** sweeps, those features do not provide simultaneous displays. (Real time digital oscilloscopes offer the same benefits of a dual-beam oscilloscope, but they do not require a dual-beam display.) The disadvantages of the dual trace oscilloscope are that it cannot switch quickly between the traces and it cannot capture two fast transient events. In order to avoid this problems a dual beam oscilloscope is used.

Analog storage oscilloscope

Trace storage is an extra feature available on some analog scopes; they used direct-view storage CRTs. Storage allows the trace pattern that normally decays in a fraction of a second to remain on the screen for several minutes or longer. An electrical circuit can then be deliberately activated to store and erase the trace on the screen.

Digital oscilloscopes

While analog devices make use of continually varying voltages, digital devices employ binary numbers which correspond to samples of the voltage. In the case of digital oscilloscopes, an analog-to-digital converter (ADC) is used to change the measured voltages into digital information.

The digital storage oscilloscope, or DSO for short, is now the preferred type for most industrial applications, although simple analog CROs are still used by hobbyists. It replaces the electrostatic storage method used in analog storage scopes with digital memory, which can store data as long as required without degradation and with uniform brightness. It also allows complex processing of the signal by high-speed digital signal processing circuits.

A standard DSO is limited to capturing signals with a bandwidth of less than half the sampling rate of the ADC (called the *Nyquist limit*). There is a variation of the DSO called the *digital sampling oscilloscope* that can exceed this limit for certain types of signal, such as high-speed communications signals, where the waveform consists of repeating pulses. This type of DSO deliberately samples at a much lower frequency than the Nyquist limit and then uses signal processing to reconstruct a composite view of a typical pulse. A similar technique, with analog rather than digital samples, was used before the digital era in *analog sampling oscilloscopes.*

A digital phosphor oscilloscope (**DPO**) uses color information to convey information about a signal. It may, for example, display infrequent signal data in blue to make it stand out. In a conventional analog scope, such a rare trace may not be visible.

Mixed-signal oscilloscopes

A mixed-signal oscilloscope (or MSO) has two kinds of inputs, a small number of analog channels (typically two or four), and a larger number of digital channels(typically sixteen). It provides the ability to accurately time-correlate analog and digital channels, thus offering a distinct advantage over a separate oscilloscope and logic analyser. Typically, digital channels may be grouped and displayed as a bus with each bus value displayed at the bottom of the display in hex or binary. On most MSOs, the trigger can be set across both analog and digital channels.

Handheld oscilloscopes

Handheld oscilloscopes are useful for many test and field service applications. Today, a hand held oscilloscope is usually a digital sampling oscilloscope, using a liquid crystal display.

Many hand-held and bench oscilloscopes have the ground reference voltage common to all input channels. If more than one measurement channel is used at the same time, all the input signals must have the same voltage reference, and the shared default reference is the "earth". If there is no differential preamplifier or external signal isolator, this traditional desktop oscilloscope is not suitable for floating measurements. (Occasionally an oscilloscope user will break the ground pin in the power supply cord of a bench-top oscilloscope in an attempt to isolate the signal common from the earth ground. This practice is unreliable since the entire stray capacitance of the instrument cabinet will be connected into the circuit. Since it is also a hazard to break a safety ground connection, instruction manuals strongly advise against this practice.)

Some models of oscilloscope have isolated inputs, where the signal reference level terminals are not connected together. Each input channel can be used to make a "floating" measurement with an independent signal reference level. Measurements can be made without tying one side of the oscilloscope input to the circuit signal common or ground reference.

PC-based oscilloscopes

A new type of oscilloscope is emerging that consists of a specialized signal acquisition board (which can be an external USB or parallel port device, or an internal add-on PCI or ISA card). The user interface and signal processing software runs on the user's computer, rather than on an embedded computer as in the case of a conventional DSO.

EX.1 ANSWER THE QUESTIONS TO THE TEXT.

1.WHAT KIND OF AN INSTRUMENT IS AN OSCILLOSCOPE?

2. WHAT PROPERTIES CAN MODERN DIGITAL INSTRUMENTS CALCULATE AND DISPLAY?

3. WHERE ARE OSCILLOSCOPES USED?

4. HOW MANY TYPES OF OSCILLOSCOPES DO YOU KNOW?

5. WHAT ARE THEIR ADVANTAGES?

EX.2 GIVE THE REVIEW OF THE TEXT.

UNIT 4

Text 1. AN AMMETER

1. Read the following words and learn them by heart:

range –диапазон
accurate –точный
to deflect –отклоняться
adjacent –смежный
to restore –восстанавливать
to align – равняться, справлять
multiplier –множитель

2. Read the text and translate it:

An **ammeter** is a measuring instrument used to measure the electric current in a circuit. Electric currents are measured inamperes (A), hence the name. Instruments used to measure smaller currents, in the milliampere or microampere range, are designated as *milliammeters* or *microammeters*. Early ammeters were laboratory instruments which relied on the Earth's magnetic field for operation. By the late 19th century, improved instruments were designed which could be mounted in any position and allowed accurate measurements in electric power systems.

The relation between electric current, magnetic fields and physical forces was first noted by Hans Christian Orsted who, in 1820, observed a compass needle was deflected from pointing the North when a current flowed in an adjacent wire. Thetangent galvanometer was used to measure currents using this effect, where the restoring force returning the pointer to the zero position was provided by the Earth's magnetic field. This made these instruments usable only when aligned with the Earth's field. Sensitivity of the instrument was increased by using additional turns of wire to multiply the effect – the instruments were called "multipliers".

3. Answer the questions:

1. What measurements does an ammeter take?
2. What instruments are designated as milliammeters or microammeters?
3. What did early ammeters rely on for operation?

4. What fact was observed by Hans Christian Orsted in 1820?
5. In what position were tangent galvanometers usable?
6. How was sensitivity of multipliers made increased ?

4. Write down from the text all underlined words and give their Russian equivalents.

Text 2. TYPES OF AMMETERS

1. Read the following words and learn them by heart:

Coil –виток, кольцо, спираль
Spiral– спиральный, винтовой, спираль
Sensitive – чувствительный, прецизионный, точный
Essentially – существенным образом
Hairspring – волосковая пружинка
Vane – стабилизатор, флюгер, диоптр
To repel –отталкивать
Value – ценность
Shunt – шунт
Sine – синус, без (пред.)
To transfer –передавать
To estimate –оценивать
Swamp –засыпать, засасывать
Leakage - утечка

2. Read and the text and translate it:

The D'Arsonval galvanometer is a moving coil ammeter. It uses magnetic deflection, where current passing through a coil causes the coil to move in a magnetic field. The modern form of this instrument was developed by Edward Weston, and uses two spiral springs to provide the restoring force. The uniform air gap between the iron core and the permanent magnet poles make the deflection of the meter linearly proportional to current. These meters have linear scales. Basic meter movements can have full-scale deflection for currents from about 25microamperes to 10milliamperes.

Because the magnetic field is polarized, the meter needle acts in opposite directions for each direction of current. A DC ammeter is thus sensitive to which way round it is connected; most are marked with a positive terminal, but some have center-zero mechanisms and can display currents in either direction. A moving coil meter indicates the average (mean) of a varying current through it, which is zero for AC. For this reason moving-coil meters are only usable directly for DC not AC.

This type of meter movement is extremely common for both ammeters and other meters derived from them, such asvoltmeters and ohmmeters. Although their use has become less common in recent decades, this type of basic movement was once the standard indicator mechanism for any analogue displays involving electrical machinery.

Moving magnet ammeters operate on essentially the same principle as moving coil, except that the coil is mounted in the meter case, and a permanent magnet moves the needle. Moving magnet ammeters are able to carry larger currents than moving coil instruments, often several tens of amperes, because the coil can be made of thicker wire and the current does not have to be carried by the hairsprings. Indeed, some ammeters of this type do not have hairsprings at all, instead using a fixed permanent magnet to provide the restoring force.

An electrodynamic movement uses an electromagnet instead of the permanent magnet of the d'Arsonval movement. This instrument can respond to both alternating and direct currentand also indicates true RMS for a wattmeter.

Moving iron ammeters use a piece of iron which moves when acted upon by the electromagnetic force of a fixed coil of wire. This type of meter responds to both direct and alternating currents (as opposed to the moving-coil ammeter, which works ondirect current only). The iron element consists of a moving vane attached to a pointer, and a fixed vane, surrounded by a coil. As alternating or direct current flows through the coil and induces a magnetic field in both vanes, the vanes repel each other and the moving vane deflects against the restoring force provided by fine helical springs. The deflection of a moving iron meter is proportional to the square of the current. Consequently, such meters would normally have a non linear scale, but the iron parts are usually modified in shape to make the scale fairly linear over most of its range. Moving iron instruments indicate the RMS value of any AC waveform applied.

The moving-iron meter was invented by an Austrian engineer Friedrich Drexler in 1884.

In a hot-wire ammetera current passes through a wire which expands as it heats. Although these instruments have slow response time and low accuracy, they were sometimes used in measuring radio-frequency current.These also measure true RMS for an applied AC current.

In much the same way as the analogue ammeter formed the basis for a wide variety of derived meters, including voltmeters, the basic mechanism for a digital meter is a digital voltmeter mechanism, and other types of meter are built around this.

Digital ammeter designs use a shunt resistor to produce a calibrated voltage proportional to the current flowing. This voltage is then measured by a digital voltmeter, through use of an analog to digital converter (ADC); the digital display is calibrated to display the current through the shunt. Such instruments are generally calibrated to indicate the RMS value *for a sine wave only* but some designs will indicate true RMS (sometimes with limitations as to wave shape).

There is also a range of devices referred to as integrating ammeters. In these ammeters the current is summed over time, giving as a result the product of current and time; which is proportional to the energy transferred with that current. These can be used for energy meters (watt-hour meters) or for estimating the charge of battery or capacitor.

A picoammeter or pico ammeter measures very low electrical current usually from the picoampere range at the lower end to the milliampere range at the upper end.Picoammeters are used for sensitive measurements where the current being measured is below the theoretical limits of sensitivity of other devices, such asMultimeters.

Most picoammeters use a "virtual short" technique and have several different measurement ranges that must be switched between to cover multiple decades of measurement. Other modern picoammeters use log compression and a "current sink" method that eliminates range switching and associated voltage spikes.Special design and usage considerations must be observed in order to reduce leakage current which may swamp measurements such as special insulators and driven shields, triaxial cable is often used for probe connections.

3. Answer the following questions:
1. How many types of ammeters can you enumerate?
2. How can you describe ‘magnetic deflection’?
3. What instrument was developed by Edward Weston?
4. What makes the deflection of the meter linearly proportional to current?

5. How does the magnetic field being polarized effect the meter needle?
6. What kind of meters are derived from
7. What is the difference between moving magnet ammeters and moving-coil ones?
8. How do electromagnetic instruments work?
9. What ammeters use an element of iron to
10. What does an iron element consist of?
11. How do the vanes function?
12. What is the deflection of a moving iron meter proportional to?
13. What ammeters were sometimes used in measuring radio-frequency current?
14. What is the basic mechanism for a digital voltmeter?
15. How is a calibrated voltage measured?
16. Why are some devices grouped as integrated ammeters?
17. What are integrated ammeters used for?
18. What ammeters are used for sensitive measurements with very low electrical current?
19. What technique do most pico ammeters use to cover multiple decades of measurements?
20. What do other modern pico ammeters use to eliminate range switching and associated voltage spikes?
21. What must be observed in order to reduce leakage current which may swamp certain measurements?

4. Choose the appropriate word in the brackets and put in the sentence:

1. The moving meters have (linear/nonlinear) scales.
2. Most moving coil meters are marked with a (negative/positive) terminal.
3. The use of voltmeters or ohmmeters has become (more/less) common in recent decades.
4. Moving magnet ammeters operate on essentially (the sane/different) principle as moving-coil ones.
5. The deflection of a moving iron meter is (proportional/non proportional) to the square of the current.
6. A current passes through a wire which (expands/narrows) as it heats.
7. The analogue ammeter formed the basis for a

wide variety of derived meters, (excluding/including) voltmeters.

8. In sensitive measurements the current being measured is (below/above) the theoretical limits of sensitivity of other devices, such as multimeters.

5. Write down from the text all underlined words and give their Russian equivalents.

Text 3. APPLICATION OF AMMETERS

1. Read the following words and learn them by heart:

Burden – груз, ноша
Integer – целое число, нечто целое
Commonly – обычно, широко распространенный
Discharging – разрядка
To pivot – вертеться, вращаться
Similar – подобный
Portable – переносной
Probe – зонд, щуп

2. Read the text and translate it:

The majority of ammeters are either connected in series with the circuit carrying the current to be measured (for small fractional amperes), or have their shunt resistors connected similarly in series. In either case, the current passes through the meter or (mostly) through its shunt. Ammeters must not be connected directly across a voltage source since their internal resistance is very low and excess current would flow. Ammeters are designed for a low voltage drop across their terminals, much less than one volt; the extra circuit losses produced by the ammeter are called its "burden" on the measured circuit.

Ordinary Weston-type meter movements can measure only milliamperes at most, because the springs and practical coils can carry only limited currents. To measure larger currents, a resistor called a *shunt* is placed in parallel with the meter. The resistance of shunts is in the integer to fractional milliohm range. Nearly all of the current flows through the shunt, and only a small fraction of it flows through the meter. This allows the meter to measure large currents. Traditionally, the meter used with a shunt has a full-scale deflection (FSD) of 50 mV, so shunts are typically designed to produce a voltage drop of 50 mV when carrying their full rated current.

Zero-center ammeters are used for applications requiring current to be measured with both polarities, common in scientific and industrial equipment. Zero-center ammeters are also commonly placed in series with a battery. In this application, the charging of the battery deflects the needle to one side of the scale (commonly, the right side) and the discharging of the battery deflects the needle to the other side. A special type of zero-center ammeter for testing high currents in cars and trucks has a pivoted bar magnet that moves the pointer, and a fixed bar magnet to keep the pointer centered with no current. The magnetic field around the wire carrying current to be measured deflects the moving magnet.

Since the ammeter shunt has a very low resistance, mistakenly wiring the ammeter in parallel with a voltage source will cause a short circuit, at best blowing a fuse, possibly damaging the instrument and wiring, and exposing an observer to injury.

In AC circuits, a current transformer converts the magnetic field around a conductor into a small AC current, typically either 1A or 5A at full rated current that can be easily read by a meter. In a similar way, accurate AC/DC non-contact ammeters have been constructed using Hall effectmagnetic field sensors. A portable hand-held clamp-on ammeter is a common tool for maintenance of industrial and commercial electrical equipment, which is temporarily clipped over a wire to measure current. Some recent types have a parallel pair of magnetically soft probes that are placed on either side of the conductor.

3. Answer the following questions:

1. What are the two ways of connection of the majority of ammeters?
2. How does the current pass in these two cases?
3. What is meant by ‘burden’ on the measured circuit?
4. Why can ordinary Weston- type meter movements measure only milliamperes?
5. What is used to measure larger currents?
6. Shunts carrying their full rate current are designed to produce a voltage drop, are not they?
7. What are zero-center ammeters used for?
8. What does a special type of zero-center ammeters have to test high currents in cars and trucks?
9. How does a cur- rent transformer convert the

magnetic field around a conductor in AC circuits?

10. What kind of tool is common for maintenance of industrial and commercial electrical equipment?

4. Form Participle I and Participle II from the following verbs and use them in your own sentences:

to carry	to connect
to measure	to design
to place	to deflect
to move	to convert
to clip	to construct
to require	to place

VOLTMETER

1. Read the following words and learn them by heart:

Scale –градация, шкала
Numerical – числовой, цифровой
Suitably – соответствующим образом
Precision – точность
Available – доступный, имеющийся в наличии

2. Read the text and translate it:

A voltmeter is an instrument used for measuring electrical potential difference between two points in an electric circuit. Analog voltmeters move a pointer across a scale in proportion to the voltage of the circuit; digital voltmeters give a numerical display of voltage by use of an analog to digital converter.

Voltmeters are made in a wide range of styles. Instruments permanently mounted in a panel are used to monitor generators or other fixed apparatus. Portable instruments, usually equipped to also measure current and resistance in the form of amultimeter, are standard test instruments used in electrical and electronics work. Any measurement that can be converted to a voltage can be displayed on a meter that is suitably calibrated; for example, pressure, temperature, flow or level in a chemical process plant.

General purpose analog voltmeters may have an accuracy of a few percent of full scale, and are used with voltages from a fraction of a volt to several thousand volts. Digital meters can be made with high accuracy, typically better than 1%. Specially calibrated test instruments have higher accuracies, with laboratory instruments capable of measuring to accuracies of a few parts per million. Meters using amplifiers can measure tiny voltages of microvolts or less.

Part of the problem of making an accurate voltmeter is that of calibration to check its accuracy. In laboratories, the Weston Cell is used as a standard voltage for precision work. Precisionvoltagereferencesare available based on electronic circuits.

3. Answer the following questions:
1. What is a voltmeter used for?
2. What are the two types of voltmeters?
3. How do analogue computers differ from digital ones?
4. What instruments monitor generators or other fixed apparatus?
5. What standard test instruments are used in electrical and electronics work?
6. What test instruments have higher accuracies and why?
7. What is used as a standard voltage for precision work in laboratories?

- 1. Find in the text the information about the function of **analogue** and **digital voltmeters** and put it down.

2. Give a written translation of the sentences containing this information.

UNIT 5

ANTENNA

1. Find the transcription of the following English words and then learn them by heart:

To supply –снабжать, поставлять, подводить (напр. ток)
Current –струя, поток, течение, ток
Frequency - частота
To oscillate – колебаться, вибрировать
To intercept– перехватить, прерывать, останавливать
Voltage – напряжение
To apply – применять, прикладывать
To amplify –расширять, усиливать
Charge – заряд, нагрузка
Transverse- поперечный
To exert – вызывать (напряжение)
Gain – увеличение, усиление
Horn – рупор, звукоприемник
Pattern – образец, шаблон
Focal – фокусный, центральный

2. Read the whole text and translate it:

An antenna (or aerial) is an electrical device which converts electrical power into radio waves, and vice versa. It is usually used with a radio transmitter or radio receiver. In transmission, a radio transmitter supplies an electric current oscillating at radio frequency (i.e. a high frequency alternating current to the antenna's terminals, and the antenna radiates the energy from the current as electromagnetic waves (radio waves). In reception, an antennainterceptssome of the power of an electromagnetic wave in order to produce a tiny voltage at its terminals, that is applied to a receiver to be amplified.

Antennas are essential components of all equipment that uses radio. They are used in systems such as radio broadcasting, broadcast television, two-way radio, communications receivers, radar, cell phones, and satellite communications, as well as other devices such as garage door openers, wireless microphones, Bluetooth-enabled devices, wireless computer networks, baby monitors.

Typically an antenna consists of an arrangement of metallic conductors (elements), electrical- ly connected (often through a transmission line) to the receiver or transmitter. An oscillating current of electrons forced through the antenna by a transmitter will create an oscillating magnetic field around the antenna elements, while the charge of the electrons also creates an oscillating electric field along the elements, causing them to move back and forth, thus, creating oscillating currents in the antenna.

Antennas can be designed to transmit and receive radio waves in all horizontal directions equally (omnidirectional antennas), or preferentially in a particular direction (directional or high gain antennas). In the latter case, an antenna may also include additional elements or surfaces with no electrical connection to the transmitter or receiver, such as parasitic elements, parabolic reflectors or horns, which serve to direct the radio waves into a beam or other desired radiation pattern.

The first antennas were built in 1888 by German physicist Heinrich Hertz in his pioneering experiments to prove the existence of electromagnetic waves predicted by the theory of James Clark Maxwell. Hertz placed dipole antennas at the focal point of parabolic reflectors for both transmitting and receiving. He published his work in a German scientific journal "*Annalender Physik und Chemie* "(vol. 36, 1889).

3. Answer the questions:

1. What is an antenna?
2. What special devices is it used with?
3. What occurs to the antenna in transmission when a radio transmitter supplies an electric current oscillating at radio frequency to its terminals?
4. What is applied to a receiver to be amplified in reception?
5. What radio systems and other devices are antennas used in?
6. What arrangement does a typical antenna consist of?
7. When will an oscillating current of electrons create an oscillating magnetic field around the antenna elements?
8. What is an oscillating electric field along the elements created by?
9. What year were the first antennas built in?
10. Whose theory was the existence of electromagnetic waves by?
11. Who published the work in a scientific journal *Analen der Physic und Chemie*?

4. Find in the text the following English equivalents :

Наоборот, переменный ток высокого напряжения, для того чтобы, такие как, наряду с, беспроводные компьютерные сети, переменный ток, заряд электронов, заставляя двигаться взад и вперед, в последнем случае, будучи предсказанными, как для передачи так и для получения.

5. Complete the following verbs with the appropriate prepositions

into, to (5), on, by (3), with, at, of, in, from and use them in your own sentences:

1. to be associated … 2. to result … 3. to lead … 4. to oscillate … 5. to consist … 6. to be transported … 7. to refer … 8. to be opposed … 9. to be supported … 10. to originate … 11. to be generated … 12. to be appreciated … 13. toapply … 14. to be connected … 15. to rely …

TERMINOLOGY

1. Transcribe the following English words and then learn them by heart:

Although –хотя
Interchangeably –взаимозаменяемо, равнозначно
Occasionally –иногда
Rigid –жесткий
Aerial –антенна
Wireless –беспроводной
To attribute –относиться
Estate –имение
Approximately –приблизительно
Prominence-выдающеесяположение, известность
Enclosure -вложение

2. Read the text about the history of the origin of the word antenna and discuss it:

The words *antenna* (in plural: *antennas* in US English, although both “antennas” and “antennae” are used in International English) and *aerial* are used interchangeably. Occasionally a rigid metallic structure is called an “antenna” while the wire form is called an “aerial". However, note the important international technical journal, the IEEE *Transactions on Antennas and Propagation*. In the United Kingdom and other areas where British English is used, the term "aerial" is sometimes used although "antenna"has been universal in professional use for many years.

The origin of the word *antenna* relative to wireless apparatus is attributed to Italian radio pioneer Guglielmo Marconi. In the summer of 1895, Marconi began testing his wireless system outdoors of his father's estate near Bologna and soon began to experiment with long wire "aerials". Marconi discovered that by arranging these "aerials"vertically and placing them in the ground (that is, by grounding them) that the range of his wireless system was significantly increased. Soon he was able to transmit signals over a hill, a distance of approximately 2.4kilometres(1.5 mi.). In Italian a tent pole is known as *l'antenna central*, and the pole with the wire was simply called*l'antenna*. Until then wireless radiating transmitting and receiving elements were known simply as aerials or terminals.

Because of his prominence, Marconi's use of the word *antenna* (Italian for pole) spread among wireless researchers, and later to the general public.

In common usage, the word *antenna* may refer broadly to an entire assembly including support structure, enclosure (if any), etc. in addition to the actual functional components. Especially at microwave frequencies, a receiving antenna may include not only the actual electrical antenna but an integrated preamplifieror mixer.

3. Complete the following word forming table:

Verb **Noun**	**Adjective**	**Adverb**
Actuate Actuality	. . .	Actually
Attribute Attribute	Attributive	. . .
Signify …	Significant	Significantly
Broaden Breadth	…	Broadly
Relate	Relative	Relatively

…		
Frequent	…	Frequently
Frequency		
…	Simple	Simply
Simplicity		

4. Answer the questions to the text:
1. What are the two forms of the English word *antenna*?
2. Which part of an antenna is called *antenna* and which one is *aerial*?
3. Who is attributed to the origin of the word antenna relative to wireless apparatus?
4. When and where did Marconi begin testing his wireless system?
5. What did he discover by arranging the 'aerials' in a vertical position?
6. What was his great discovery?
7. What names of wireless radiating transmitting and receiving elements were known before they were called *l'antenna*?
8. What word may be broadly referred to in common usage?

CATEGORIES OF ANTENNAS

1. Find the transcription of the following English words and then learn them by heart:

To couple – соединять, сцеплять
To be equippedwith – быть оборудованным, оснащенным
Available – доступный, имеющийся в наличии
Omnidirectional –не имеющий определенного направления действия
To be employed –применяться, использоваться
Beams –лучи
Preferentially –предпочтительно
Cell –ячейка
Dipole –двухполюсный
With the exception of –заисключением
Blind – слепой
Cone – конус, пучок
Null – недействительный, нулевой
Coaxial –имеющий общую ось
Regardless – независимо от

2. Read the text and translate it into Russian:

Antennas are required by any radio receiver or transmitter to couple its electrical connection to the electromagnetic field. Radio waves are electromagnetic waves which carry signals through the air (or through space) at the speed of light with almost no transmission loss. In each and every case, the transmitters and receivers involved require antennas, although these are sometimes hidden (such as the antenna inside an AM radio or inside a laptop computer equipped with Wi-Fi).

According to their applications and technology available, antennas generally fall in one of two categories:

1.Omnidirectional or only weakly directional antennas which receive or radiate more or less in all directions. These are employed when the relative position of the other station is unknown or arbitrary. They are also used at lower frequencies where a directional antenna would be too large, or simply to cut costs in applications where a directional antenna isn't required. In common usage "omnidirectional" usually refers to all horizontal directions typically with reduced performance in the direction of the sky or the ground (a truly isotropic radiator isn't even possible).

2.Directional or *beam* antennas are intended to preferentially radiate or receive in a particular direction or directional pattern. "A directional" antenna usually is intended to maximize its coupling to the electromagnetic field in the direction of the other station, or sometimes to cover a particular sector such as a 120 horizontal fan pattern in the case of a panel antenna at a cell site.

One example of omnidirectional antennas is the very common *vertical* antenna or whip antenna consisting of a metal rod (often but not always, a quarter of a wavelength long). A dipole antenna is similar but consists of two such conductors extending in opposite directions, with a total length that is often but not always, a half of a wavelength long. Dipoles are typically oriented horizontally in which case they are weakly directional: signals are reasonably well radiated toward or received from all directions with the exception of the direction along the conductor itself; this region is called the antenna blind cone or null.

Both the vertical and dipole antennas are simple in construction and relatively inexpensive. The dipole antenna, which is the basis for most antenna designs, is a bal- anced component, with equal but opposite voltages and currents applied at its two terminals through a balanced transmission line (or to a coaxial transmission line through a so-called balloon). The vertical antenna, on the other hand, is a *monopole* antenna. It is typically connected to the inner conductor of a coaxial transmission line (or a matching network); the shield of a transmission line is connected to the ground. In this way, the ground (or any large conductive surface) plays the role of the second conductor of a dipole, thereby forming a complete circuit. Since monopole antennas rely on a conductive ground, a so-called grounding structure may be employed to provide a better ground contact to the earth or which itself acts as a ground plane to perform that function regardless of (or in absence of) an actual contact with the earth.

3. Answer the following questions to the text:

1. Why are antennas so required by any radio transmitter or receiver?
2. According to what functions do antennas usually fall in one of two categories?
3. What can you say about the application of omnidirectional antennas?
4. What can you say about the application of directional antennas?
5. How does a dipole antenna differ from a whip antenna?
6. What are the similarities between vertical and dipole antennas?

4. Make up collocations of the following words:

Electromagnetic	the air (space)
To carry	links
Transmitting	coupling
Trunk	direction
Through	case
Radio	Wi-Fi
In each	loss
To be equipped with	signals
Relative	circuit
In a particular	astronomy
A complete	position

ANTENNA ARRAYS

1. Find the transcription of the following English words and then learn by heart:

Consequently – следовательно
To accomplish – выполнять
Plethora – изобилие
Angle – угол
To deliver – доставлять,
Array – многовибраторная сложная антенна
Loop – петля
To obtain – получать
Fringe – добавочный, дополнительный
Superficially – поверхностно, неглубоко
Impedance – полное сопротивление
Coil – виток, спираль
To cancel –отменять
Insulated – изолированный
To interfere with – мешать, препятствовать

2. Read the text and translate it:

Antennas more complex than the dipole or vertical designs are usually intended to increase the directivity and consequently the gain of the antenna. This can be accomplished in many different ways leading to a plethora of antenna designs. The vast majority of antennasis fed with a balanced line (unlike a monopole antenna) and is based on the dipole antenna with additional components (or *elements*) which increase its directionality. Antenna "gain" in this instance describes the concentratingofthe radiated power into a particular solid angle of space, as opposed to the spherically uniform radiation of the ideal radiator. The increased power in the desired direction is at the expense of that in the undesired directions. Power is conserved, and there is no net power increase over that delivered from the power source (the transmitter).

For instance, a phased array consists of two or more simple antennas which are connected together through an electrical network. This often involves a number of parallel dipole antennas with some certain spacing. Depending on the relative phase introduced by the network, the same combination of dipole antennas can operate as a "broadside array" (directional normal to a line connecting the elements) or as an "end-fire array" (directional along the line connecting the elements). Antenna arrays may employ any basic (omnidirectional or weakly directional) antenna type, such as dipole, loop or slot antennas. These elements are often identical.

However a long-periodic dipole array consists of a number of dipole elements of *different* lengths in order to obtain a somewhat directional antenna having an extremely wide bandwidth: these are frequently used for television reception in fringe areas. The dipole antennas composing it are all considered "active elements" since they are all electrically connected together (and to the transmission line). On the other hand, a superficially similar dipole array, the Yagi-Uda Antenna (or simply Yagi), has only one dipole element with an electrical connection; the other so-called parasitic elements interact with the electromagnetic field in order to realize a fairly directional antenna but one which is limited to a rather narrow bandwidth. The Yagi antenna has similar looking parasitic dipole elements but which act differently due to their somewhat different lengths. There may be a number of so-called directors in front of the active element in the direction of propagation, and usually a single (but possibly more) "reflector" on the opposite side of the active element.

Greater directionality can be obtained by using beam-forming techniques such as a parabolic reflector or a horn. Since high directivity in an antenna depends on it being large compared to the wavelength, narrow beams of this type are more easily achieved at UHF and microwave frequencies.

At low frequencies (such as AM broadcast), arrays of vertical towers are used to achieve directionality and they will occupy large areas of land. For reception, a long Beverage antenna can have significant directivity. For non-directional portable use, a short vertical antenna or small loop antenna works well, with the main design challenge being that of impedance matching. With a vertical antenna *a loading coil* at the base of the antenna may be employed to cancel the reactive component of impedance; small loop antennas are tuned with parallel capacitors for this purpose.

An antenna lead-in is the transmission line (or *feed line*) which connects the antenna to a transmitter or receiver. The *antenna feed* may refer to all components connecting the antenna to the transmitter or receiver, such as an impedance matching network in addition to the transmission line. In a so-called aperture antenna, such as a horn or parabolic dish, the 'feed' may also refer to a basic antenna inside the entire system (normally at the focus of a parabolic dish or at the throat of a horn) which could be considered the one active element in that antenna system. A microwave antenna may also be fed directly from a waveguide in lieu of a (conductive) transmission line.

An antenna counterpoise or ground plane is a structure of conductive material which improves or substitutes for the ground. It may be connected to or insulated from the natural ground. In a monopole antenna, this aids in the function of the natural ground, particularly where variations (or limitations) of the characteristics of the natural ground interfere with its proper function. Such a structure is normally connected to the return connection of an unbalanced transmission line such as the shield of a coaxial cable.

An electromagnetic wave *refractor*in some aperture antennas is a component which due to its shape and position functions to selectively delay or advance portions of the electromagnetic wave front passing through it. The refractor alters the spatial characteristics of the wave on one side relative to the other side. It can, for instance, bring the wave to a focus or alter the wave front in other ways, generally in order to maximize the directivity of the antenna system. This is the radio equivalent of an optical lens.

An antenna coupling network is a passive network (generally a combination of inductive and capacitive circuit elements) used for impedance matching in between the antenna and the transmitter or receiver. This may be used to improve the standing wave ratio in order to minimize losses in the transmission line and to present the transmitter or receiver with standard resistive impedance that it expects to see for optimum operation.

3. Answer the following questions:

1. How are more complex antennas intended to function?
2. What is the vast majority of designs based on to increase directionality?
3. What does a phased array consist of?
4. How can the combination of dipole antennas with a certain spacing function? What does it depend on?
5. What types of antenna may antenna arrays employ?
6. Whatantenna arrays are frequently used for television reception in fringe areas?
7. How can greater directionality be achieved?
8. What antenna arrays are used to achieve directionality at low frequencies?
9. What kind of antenna can be employed to cancel the reactive component of imped- ance?

5. Substitute the words ***in italics*** with the synonyms from the list: hinder, number, staff, instead of, aim, additional, comprises.

1. This can be accomplished in many different ways leading to a ***plethora*** of antenna designs.
2. This often ***involves*** a number of parallel dipole antennas with some certain spacing.
3. They are frequently used for television reception in ***fringe*** areas.
4. Small loop antennas are tuned with parallel capacitors for this ***purpose***.
5. A microwave antenna may also be fed directly from a waveguide in ***lieu of*** a transmission line.
6. An antenna counterpoise is a structure of conductive ***material*** which improves or substitutes for the ground.
7. The function of an electromagnetic wave refractor in some aperture antennas is to selectively ***delay*** or advance some portions of the electromagnetic wave front passing through it.

6. Form and translate nouns from the following verbs with the help of suffixes - ment,- ance/ence, -ure,-tion, -y, -or/er:

accomplish, lead, describe, deliver, consist, connect, depend, employ, compose, consider, interact, obtain, achieve, occupy, conduct, interfere, delay, advance, alter, maximize

CHARACTERISTICS

1. Find the transcription of the following English words and learn them by heart:

To measure –измерять
To sacrifice – приносить в жертву, жертвовать
To maintain – поддерживать, сохранять, содержать в исправности
To claim – утверждать, заявлять
Vendor – продавец
To tilt – наклоняться, сталкиваться, опрокидываться
To obtain - получать

2. Read the text and translate it:

Antennas are characterized by a number of performance measures which a user may be concerned with in selecting or designing an antenna for a particular application. Chief among these relate to the directional characteristics and the resulting *gain.*

Even in omnidirectional (or weakly directional) antennas, the gain can often be increased by concentrating more of its power in the horizontal directions, sacrificing power radiated toward the sky and ground. The antennas power gain (or simply "gain") also takes into account the antennas efficiency, and is often the primary figure of merit.

Resonant antennas are expected to be used a particular resonant frequency; an antenna must therefore be built or ordered to match the frequency range of the intended application. A particular antenna design will present some particular feed point impedance. While this may affect the choice of an antenna, an antenna's impedance can also be adapted to the desired impedance level of a system using a machine network while maintaining the other characteristics (except for a possible loss of efficiency).

Also these parameters can all the same be measured though such measurements are difficult and require very specialized equipment. Beyond tuning a transmitting antenna using an SWR meter, the typical user may depend on theoretical predictions based on the antenna design or on claims of a vendor.

An antenna transmits and receives radio waves with a particular polarization which can be reoriented by tilting the axis of the antenna in many (but not all) cases. The physical size of an antenna is often a practical issue, particular at low frequencies (longer wavelengths). Highly directional antennas need to be significantly larger thanthe wavelength. Resonant antennas usually use a linear conductor (or element), or pair of such elements, each of which is about a quarter of the wavelength in length (an odd multiple of quarter wavelengths will also be resonant). Antennas that are required to be small compared to the wavelength sacrifice efficiency and cannot be directional. Fortunately, at higher frequencies (UHF, microwaves) trading off performance to obtain a smaller physical size is usually not required.

3. Answer the following questions:

1. How can the resulting gain often be increased?
2. What mal affect the choice of an antenna?
3. What will the typ- ical user depend on choosing an

antenna?

4. What can reorient an antenna transmitting and receiving radio waves with a particular polarization?

5. What is important about an antenna particularly at longer wavelengths?

What kind of antennas cannot be very directional?

4. Complete sentences 1-5 with endings a-e below:

1. A user is often concerned with a number of performance measures … ---
2. The antenna's power gain considered to be … ---
3. An antenna is expected to be built or ordered … ---
4. Very specialized equipment is … ---
5. A particular antenna design … ---

a) … required to take antenna's measurements.
b) … to match the frequency range of the intended application.
c) … when he selects and designs an antenna.
d) … reveals its particular feed point impedance.
e) … the primary figure of merit.

5. Fill in the gaps with the appropriate missing parts:

- directional variation of the dipole with parasitic elements added; - be built for any frequency;- is useful as a theoretical model of comparison;
- of an active element at the focus of;- and make theoretical analysis extremely difficult;- mainly of a square conductor;
- to be omnidirectional in the plane perpendicular to the axis of the antenna

There are many variations of antennas. Here are a few basic models.

The isotropic radiator is a purely *theoretical* antenna that radiates equally in all directions. It is considered to be a point in space with no dimensions and no mass. This antenna cannot physically exist, but (1). . . . . .with all other antennas. Most antennas' gains are measured with reference to an isotropic radiator, and are rated in dBi (decibels with respect to an isotropic radiator).

The *dipole* antenna is simply two wires pointed in opposite directions arranged either horizontally or vertically, with one end of each wire connected to the radio and the other end hanging free in space. Since this is the simplest practical antenna, it is also used as a reference model for other antennas; gain with respect to a dipole is labeled as dBd. Generally, the dipole is considered (2) . . . ., but it has deep nulls in the directions of the axis. Variations of the dipole include the folded dipole, the half wave antenna, the ground plane antenna, the whip, and the J-pole.

The *Yagi-Uda* antenna is a (3). . . . . .which are functionally similar to adding a reflector and lenses (directors) to focus a filament light bulb.

The *random wire* antenna is simply a very long (at least one quarter wavelength) wire with one end connected to the radio and the other in free space, arranged in any way most convenient for the space available. Folding will reduce effectiveness(4). . . . . (The added length helps more than the folding typically hurts.) Typically, a random wire antenna will also require an antenna tuner, as it might have a random impedance that varies non-linearly with frequency.

The *horn* antenna is used where high gain is needed, the wavelength is short (microwave) and space is not an issue. Horns can be narrow band or wide band, depending on their shape. A horn can(5). . . . ., but horns for lower frequencies are typically impractical. Horns are also frequently used as reference antennas.

The *parabolic* antenna consists (6). . . . . a parabolic reflector to reflect the waves into a plane wave. Like the horn it is used for high gain, microwave applications, such as satellite dishes.

The *patch* antenna consists (7). . . . . mounted over a groundplane. Another example of a planar antenna is the tapered slot antenna (TSA), as the Vivaldi-antenna.

UNIT 6

LASER

1. Find the transcription of the following English words and then learn them by heart:

To emit –испускать, выделять, излучать
Tight – тугой, плотный, сжатый
Property – имущество, свойство, качество
Mirror – зеркалоPartially – частично
Transparent – прозрачный
To escape – избегать
Curved – изогнутый, кривой
Consumer – потребительский
Barcode – штриховой код
Surgery – хирургия
Enforcement – давление, принуждение
Welding – сварка

2. Read the following text and translate it:

A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. The term "laser" originated as an acronym for "light amplification by stimulated emission of radiation". A laser differs from other sources of light because it emits light *coherently*. Spatial coherence allows a laser to be focused to a tight spot, enabling applications like laser cutting and lithography. Spatial coherence also allows a laser beam to stay narrow over long distances (collimation), enabling applicationssuch as laser pointers. Lasers can also have high temporal coherence which allows them to have a very narrow spectrum, i.e., they only emit a single color of light. Temporal coherence can be used to produce pulses of light – as short as femtosecond.

A laser consists of a gain medium, a mechanism to supply energy to it, and something to provide optical feedback. The gain medium is a material with properties that allow it to amplify light by stimulated emission. Light of a specific wavelength that passes through the gain medium is amplified (increases in power).

For the gain medium to amplify light, it needs to be supplied with energy. This process is called pumping.The energy is typically supplied as an electrical current, or as light at a different wavelength.

Pump light may be provided by a flash lamp or by another laser.

The most common type of laser uses feedback from an optical cavity – a pair of mirrors on other end of the gain medium. Light bounces back and forth between the mirrors, passing through the gain medium and being amplified each time. Typically one of the two mirrors, the output coupler, is partially transparent. Some part of the light escapes through this mirror. Depending on the design of the cavity (whether the mirrors are flat or curved), the light coming out of the laser may spread out or form a narrow beam. This type of device is sometimes called a laser oscillator in analogy to electronic oscillators, in which an electronic amplifier receives electrical feedback that causes it to produce a signal.

Most practical lasers contain additional elements that affect properties of the emitted light such as the polarization, the wavelength, and the shape of the beam.

Lasers have many important applications. They are used in common consumer devices such as optical disc drives, laser printers, and barcode scanners. Lasers are used for both fiber-optic and free-space optical communication. They are used in medicine for laser surgery and various skin treatments, and in industry for cutting and welding materials. They are used in military and law enforcement devices for marking targets and measuring range and speed. Laser lighting displace use laser light as an entertainment medium.

3. Answer the following questions :

1. What is a laser?
2. What does the term "laser" mean?
3. What is the difference of a laser from other sources of light?
4. What does spatial coherence allow lasers to do?
5. What does temporal coherence allow lasers to do?
6. What are the components of a typical laser? Characterize them.
7. What additional elements do most practical lasers have?
8. What can you say about spheres of application of laser?

4. Make disjunctive questions to the following sentences:

Model: Some of the light escapes through the mirror*, does not it*?

1. The process of optical amplification is based on the stimulated emission.
2. Laser emits light coherently.
3. Temporal coherence can be used to produce very short pulses of light.
4. Lasers are widely used in military and law enforcement devices.
5. The electrical feedback received by an electrical amplifier caused it to produce a signal.
6. Some additional elements in practical lasers will affect the polarization, the wavelength, and the shape of the beam.
7. Laser lighting displays have been used as entertainment medium.

5. Form Participle I and Participle II from the following verbs:

Model: To diverge – diverging – diverged.

To emit, to stimulate, to allow, to focus, to stay, to enable, to cut, to have,to use, to display, to supply, to amplify, to bounce, to spread, to cause.

LASER PHYSICS

1. Find the transcription of the following English words and then learn them by heart:

Quantum – квант
Transition – переход, перемещение, переходной
To decay – портиться, ухудшаться, распадаться
External– внешний, наружный
Random – случайный, беспорядочный
To emanate –исходить, истекать, излучать, испускать
Fluorescence – свечение, флуоресценция
Probability –вероятность, правдоподобие
To enhance – увеличивать, усиливать, усугублять
By means of – посредством
Purity – чистота, беспримесность
Liquid – жидкий
To interact with – взаимодействовать

Nitrogen – азот
Misnomer - неправильное употребление имени или термина
Diffraction – дифракция, преломление
Equilibrium – равновесие
Spatial – пространственный
To discard – отбрасывать, выбрасывать, отказываться

2. Read the following texts and translate them:

Stimulated Emission

In the classical view, the energy of an electron orbiting an atomic nucleus is larger for orbits further from the nucleus of an atom. However, quantum mechanical effects force electrons to take on discrete positions in orbitals. Thus, electrons are found in specific energy levels of an atom. When an electron absorbs energy either from light (photons) or heat (phonons), it receives the incident quantum of energy. But transmissions are only allowed in between discrete energy levels and it leads to emission lines and absorption ones.

When an electron is excited from a lower to a higher energy level, it will not stay that way forever. An electron in an excited state may decay to a lower energy state which is not occupied, according to a particular time constant characterizing that transition. When such an electron decays without external influence, emitting a photon, it is called "spontaneous emission". The phase associated with the photon that is emitted is random. A material with many atoms in such an excited state may thus result in radiation which is very spectrally limited (centered within one wavelength of light), but the individual photons would have no common phase relationship and would emanate in random directions. This is the mechanism of fluorescence and thermal emission.

An external electromagnetic field at a frequency associated with a transition can affect the quantum mechanical state of the atom. As the electron in the atom makes a transition between two stationary states (neither of which shows a dipole field), it enters a transition state which does have a dipole field, and which acts like a small electric dipole, and this dipole oscillates at a characteristic frequency. In response to the external electric field at this frequency, the probability of the atom entering this transition state is greatly increased. Thus, the rate of transitions between two stationary states is enhanced beyond that due to spontaneous emission. Such a transition to the higher state is called absorption, and it destroys an incident photon (the photon's energy goes into powering the increased energy of the higher state). A transition from a higher to a lower energy state, however, produces an additional photon; this is the process of stimulated emission.

Gain Medium and Cavity

The gain medium is excited by an external source of energy into an excited state. In most lasers this medium consists of population of atoms which have been excited into such a state by means of an outside light source, or an electrical field which supplies energy for atoms to absorb and be transformed into their excited states.

The gain medium of a laser is normally a material of controlled purity, size, concentration, and shape, which amplifies the beam by process of stimulated emission described above. This material can be of any state: gas, liquid, solid, or plasma. The gain medium absorbs pump energy, which raises some electrons into higher-energy ("excited") quantum states. Particles can interact with light by either absorbing or emitting photons. Emission can be spontaneous or stimulated. In the latter case, the photon is emitted in the same direction as the light that is passing by. When the number of particles in one excited state exceeds the number of particles in some lower-energy state, population inversion is achieved and the amount of stimulated emission due to light that passes through is larger than the amount of absorption. Hence, the light is amplified. By itself this makes an optical amplifier. When an optical amplifier is placed inside a resonant optical cavity, one obtains a laser oscillator.

In a few situations it is possible to obtain lasing with only a single pass of EM radiation through the gain medium, and this produces a laser beam without any need for a resonant or reflective cavity (for example nitrogen laser). Thus, reflection in a resonant cavity is usually required for a laser, but is not absolutely necessary.

The optical resonator is sometimes referred to as an "optical cavity", but this is a misnomer: lasers use open resonators as opposed to the literal cavity that would be employed at microwave frequencies in a maser. The resonator typically consists of two mirrors between which a coherent beam of light travels in both directions, reflecting back on itselfso that an average photon will pass through the gain medium repeatedly before it is emitted from the output aperture or lost to diffractionor absorption. If the gain(amplification) in the medium is larger than the resonator losses, than the power of the recirculating light can rise exponentially. But each stimulated emission event returns the atom from its excited state to the ground state, reducing the gain of the medium. With increasing beam power the net gain (gain minus loss) reduces to unity and the gain medium is said to be saturated. In a continuous wave (CW) laser, the balance of pump power against gain saturation and cavity losses produces an equilibrium value of the laser power inside the cavity; this equilibrium determines the operating point of the laser. If the applied pump power is too small, the gain will never be sufficient to overcome the resonator losses, and laser light will not be produced. The minimum pump power needed to begin laser action is called the lasing threshold. The gain medium will amplify any photons passing through it, regardless of direction; but only the photons in a spatial mode supported by the resonator will pass more than once through the medium and receive substantial amplification.

The Light Emitted

The light generated by stimulated emission is very similar to the input signal in terms of wavelength, phase, and polarization. This gives laser light its characteristic coherence, and allows it to maintain the uniform polarization and often monochromaticity established by the optical cavity design.

The beam in the cavity and the output beam of the laser, when travelling in free space (or a homogeneous medium) rather than waveguides (as in an optical fiber laser), can be approximated as a Gaussian beam in most lasers; such beams exhibit the minimum divergence for a given diameter. However, some high power lasers may be multimode, with the transverse modes often approximated using Hermite-Gaussian or Laguerre-Gaussian functions. It has been shown that unstable laser resonators (not used in most lasers) produce fractal shaped beams. Near the beam "waist" (or focal region) it is highly collimated: the wave fronts are planar, normal to the direction of propagation, with no beam divergence at that point. However, due to diffraction, that can only remain true well within the Rayleigh range. The beam of a single transverse mode (Gaussian beam) laser eventually diverges at an angle which varies inversely with the beam diameter, as required by diffraction theory. Thus, the "pencil beam" directly generated by a common helium-neon laser would spread out to a size of perhaps 500 kilometers when shone on the Moon (from the distance of the Earth). On the other hand, the light from a semiconductor laser typically exits the tiny crystal with a large divergence; up to 50 degrees. However even such a divergent beam can be transformed into a similarly collimated beam by means of a lens system, as is always included, for instance, in a laser pointer whose light originates from a laser diode. That is possible due to the light being of a single spatial mode. This unique property of laser light, spatial coherence, cannot be replicated using standard light sources (except by discarding most of the light) as can be appreciated by comparing the beam from a flashlight (torch) or spotlightto that of almost any laser.

Quantum vs. classical emission processes

The mechanism of producing radiation in a laser relies on stimulated emission, where energy is extracted from a transition in an atom or molecule. This is a quantum phenomenon discovered by Einstein who derived the relationship between the A coefficient describing spontaneous emission and the B coefficient which applies to absorption and stimulated emission. However, in the case of the free electron laser, atomic energy levels are not involved; it appears that the operation of this rather exotic device can be explained without reference to quantum mechanics.

3. Answer the following questions:

1. What process is called "spontaneous emission" and what is the process of stimulated emission of an electron in the atom?
2. What does the gain medium of a laser present?
3. What does an optical resonator consist of and what is its main function?
4. What allows laser light to maintain the uniform polarization?
5. What beams exhibit the minimum divergence for some diameter?
6. What kind of beam would spread out to a size of perhaps 500 hundred kilometers from the distance of the Earth?
7. What can exit the tiny crystal with a large divergence?
8. What process can be possible due to the light being of a single spatial mode?
9. What property of laser light cannot be replicated using standard light sources?
10. What do the A coefficient and the B coefficient mean according to Einstein?

4. Find the sentences used in the Passive Voice and translate them.

5. Find Participle I and Participle II in the function of attribute of the Active and the Passive Voice respectively:

1. When an electron without external influence, emit-

ting a photon, that is called "spontaneous emission".

2. The gain medium is excited by an external source of energy into an excited state.
3. In the latter case, the photon is emitted in the same direction as the light that is passing by.
4. Hence, the light is amplified.
5. With increasing beam power the net gain reduces to unity and the gain medium is said to be saturated.
6. This equilibrium determines the operating point of a laser.
7. If the applied pump power is two small the laser light will not be produced.
8. The minimum pump power is called the lasing threshold.

AS WEAPONS

1. Find the transcription of the following English words and then learn them by heart:

To incapacitate –делать неспособным или непригодным
Ability – способность
Impairment – ухудшение, повреждение
Duration – длительность, долгота
Immediate – моментальный, немедленный
Handicap – физический недостаток или увечье
Controversial – противоречивый, спорный
To ban – запрещать,
Authorities –власти
Hazard –опасность, риск
To shoot down –сбить огнем, расстрелять
Vehicle – летательный аппарат, проводник (света, звука)
Infeasibility –неосуществимость, невыполнимость, невозможность

2. Read the following text and translate it:

Lasers of all but the lowest powers can potentially be used as incapacitating weapons, through their ability to produce temporary or permanent vision loss in varying degrees when aimed at the eyes. The degree, character and duration of vision impairment caused by eye exposure to laser light varies with the power of the laser, the wavelength(s), the collimation of the beam, the exact orientation of the beam, and the duration of the exposure. Lasers of even a fraction of a watt in power can produce immediate, permanent vision loss under certain conditions, making such lasers potential non-lethal but incapacitating weapons. The extreme handicap that laser-induced blindness represents makes the use of laser even as non-lethal weapons morally controversial, and weapons designed to cause blindness have been banned by the Protocol on Blinding Laser Weapons. Incidents of pilots being exposed to lasers while flying have prompted aviation authorities to implement special procedures to deal with such hazards.

Laser weapons capable of directly damaging or destroying a target in combat are still in the experimental stage. The general idea of laser-beam weaponry is to hit a target with a train of brief pulses of light. The rapid evaporationand expansion of the surface causes shockwaves that damage the target. The power needed to project a high-powered laser beam of this kind is beyond the limit of current mobile power technology, thus favoring chemically powered gas dynamic lasers. Example experimental systems include MIRACL and the Tactical High Energy Laser.

The United States Air Force was working on the Boeing YAL-1, an airborne laser mounted in a Boeing 747. It was intended to be used to shoot down incoming ballistic missiles over enemy territory. On March 18, 2009 Northrop Grumman claimed that its engineers in Redondo Beach had successfully built and tested an electrically powered solid state laser capable of producing a 100-kilowatt beam, powerful enough to destroy an airplane. According to Brian Strickland, for the United States Army’s Joint High Power Solid Laser program, an electrically powered laser is capable of being mounted in an aircraft, ship, or other vehicle because it requires much less space for its supporting equipment than a chemical laser. However, the source of such a large electrical power in a mobile application remains unclear. The YAL-1 program was cancelled due to infeasibility in December 2011.

The United States Navy is developing a laser weapon referred to as the Laser Weapon System or LAWS.

3. Answer the following questions:

1. What factors do the degree, character and duration of vision impairment caused by eye exposure to the laser light depend on?

2. Why can some lasers bepotentially used as incapacitating weapons?

3. What kind of lasers can produce immediate, permanent vision loss under certain conditions?
4. Why have some kinds of lasers been banned by the Protocol on Blinding Laser Weapons?
5. What is the general idea of using laser- beam weaponry?
6. About what was claimed by Northrop Grumman on March 18, 2009?
7. What kind of laser according to Brian Strickland is capable of being mounted in aircraft, ship, or other vehicle and why?
8. When was the YAL-1 program approved?

4. Make questions for the following answers:
1. Temporary or permanent.
2. Incidents of pilots being exposed to lasers during their flights.
3. Laser weapons capable of damaging or destroying a target in combat.
4. The rapid evaporation and expansion of the surface.
5. MIRACL and the Tactical High Energy Laser.
6. An air-borne laser mounted in a Boeing 747.
7. It requires much less space for its supporting equipment compared to chemical laser

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Лексические модели, которые можно использовать при реферировании текстов на английском языке:	
The article/ text is headlined.... The headline of the article I have read is... The author of the article is... The article is written by... . It's published in... It's printed in...	Статья/текст называется... Название статьи, которую я прочитал... Автор статьи... Статья написана... Она опубликована... Она напечатана...
The main idea of the article is... The article is about... The article is devoted to... The article deals with.... The article touches upon.... The purpose of the article is to give the reader some information on...	Основная мысль этой статьи... Статья о... Статья посвящена... Статья связана с ... Статья затрагивает... Цель статьи – ознакомить читателя с...
The aim of the article is to provide the reader with some material (data) on.... The author starts by telling the reader that...	Цель статьи ознакомить читателя с материалами/данными о... В начале статьи автор пишет ...
The author writes (states, stresses, thinks, points out) that ...	Автор пишет, (утверждает, подчеркивает, полагает, выделяет), что...
The article describes ... According to the text ... Further the author reports (says)... It is important to note (stress, underline)...	Статья описывает, ... Согласно тексту... Далее автор сообщает... Важно отметить, (подчеркнуть)...
In conclusion.... The author comes to the conclusion that... I found the article interesting (important, dull, of no value, too hard to understand) because...	В заключение... Автор приходит к заключению, что... Статья показалась мне интересной, (важной, скучной, не представляет для меня интереса, слишком трудная для понимания), так как...

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