

ОГАОУ ДПО «Белгородский институт развития образования»

Рабочая тетрадь для проведения практических занятий  
для обучающихся III курса по дисциплине «Иностранный язык»  
по специальности  
27.02.05 «Системы и средства диспетчерского управления»

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### Пояснительная записка

Дисциплина «Иностранный язык» является общеобразовательной дисциплиной, в процессе изучения которой обучающиеся должны приобрести определенные знания.

Основной целью дисциплины «Иностранный язык» является повышение исходного уровня владения иностранным языком, достигнутого на предыдущей ступени образования, и овладения студентами необходимым и достаточным уровнем коммуникативной компетенции для решения социально-коммуникативных задач в различных областях бытовой, культурной, профессиональной и научной деятельности при общении с зарубежными партнерами, при подготовке научных работ, а также для дальнейшего самообразования.

В процессе изучения дисциплины решаются следующие основные задачи:

- формирование социокультурной компетенции и поведенческих стереотипов, необходимых для успешной адаптации выпускников на рынке труда;
- развитие у студентов умения самостоятельно приобретать знания для осуществления бытовой и профессиональной коммуникации на иностранном языке
- повышение уровня учебной автономии, способности к самообразованию, к работе с мультимедийными программами, электронными словарями, иноязычными ресурсами сети Интернет;
- развитие когнитивных и исследовательских умений, расширение кругозора и повышение информационной культуры студентов;
- формирование представления об основах межкультурной коммуникации, воспитание толерантности и уважения к духовным ценностям разных стран и народов;
- расширение словарного запаса и формирование терминологического аппарата на иностранном языке в пределах профессиональной сферы.

Содержание учебной дисциплины «Иностранный язык» делится на основное, которое изучается вне зависимости от профиля профессионального образования, и профессионально направленное, предназначенное для освоения профессии СПО 27.02.05 «Системы и средства диспетчерского управления». Именно акцент на лексику позволит обогатить терминологический словарь и будет способствовать развитию языковых компетенций.

Рабочая тетрадь предназначена для студентов 3 курса, обучающихся по специальности 27.02.05 «Системы и средства диспетчерского управления». Рабочая тетрадь составлена с учетом требований ФГОС СПО третьего поколения.

Цель данной рабочей тетради ввести студентов в область иноязычного письменного и устного общения по специальности и помочь усвоению программы, в дальнейшем для сдачи дифференцированного зачёта. К каждому

учебному занятию предлагаются задания для аудиторных занятий студентов, направленные на совершенствование лексического и грамматического материала.

В результате изучения данного пособия студент должен:

- знать и понимать лексику по специальности;
- переводить тексты;
- отвечать на вопросы к нему;
- выполнять задания по темам;
- знать грамматический материал.

Рабочая тетрадь также нацелена на развитие и закрепление монологических и грамматических навыков и умений, необходимых для чтения и понимания профессиональных текстов.

Актуальность составления данной рабочей тетради обусловлена необходимостью учебно-методического обеспечения дисциплины «Иностранный язык» для специальности 27.02.05 «Системы и средства диспетчерского управления», а также потребностью активного использования профессиональной лексики как основы овладения иноязычной коммуникативной компетенцией. При составлении рабочей тетради в течение учебного года проводились такие работы, как подбор теоретического материала в соответствии с программой дисциплины, использование коммуникативных приёмов обучения, ориентированных на профессиональную тематику, учитывающих необходимость развития специфических умений речевой и интеллектуальной деятельности.

Рабочая тетрадь направлена на повышение мотивации обучающихся к изучению дисциплины «Иностранный язык», развитие гибкого логического и пространственного мышления обучающихся, развитие профессиональных компетенций учащейся молодежи.

В рабочей тетради содержатся упражнения для освоения основных приемов овладения дисциплиной для специальности 27.02.05 «Системы и средства диспетчерского управления» по следующим темам:

- Измерительные приборы
- Резисторы
- Электрические элементы
- Конденсаторы
- Проводники и изоляторы
- Коммуникация. Телекоммуникация
- Линии передач
- Кабели
- Телефония
- Антенны
- Радары
- Радиопомехи

Лексические упражнения предполагают построение и усвоение обучающимися связей между специфическими для изучаемой области

деятельности понятиями и суждениями, отражёнными в текстах. При этом приёмы усвоения лексики направлены на интеграцию и комплексное развитие лексических навыков, речевых умений, компетенций, связанных с отбором, обработкой и интерпретацией информации, профессиональных знаний.

Системы типовых ключевых вопросов, которые отражают содержание проблемных ситуаций, возникающих в реальной профессиональной деятельности.

Работа с текстом для формирования информационной базы, достаточной для эффективного выполнения обучающимися заданий проблемного характера.

Рабочая тетрадь содержит практико-ориентированные задания, которые нацелены на совершенствование коммуникативной компетенции в деловой и выбранной профессиональной сфере, а также на повторение и закрепление грамматических и лексических структур, которые наиболее часто используются в деловой и профессиональной речи.

Таким образом, предлагаемое пособие можно использовать для индивидуальной работы студентов на занятиях под руководством преподавателя, а также для самостоятельной работы обучающихся.

## Unit 1. Measuring instruments



### I. Read the text and match the measuring instruments with their definitions.


#### Measuring instruments

A measuring instrument is a device to measure 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.

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.

<p>1.</p> 	<p>a) The meter used for measuring the current is known as the ammeter. The current is the flow of electrons whose unit is ampere. The instrument that measures the flows of current in ampere is known as ampere meter or ammeter.</p>
<p>2.</p> 	<p>b) Ohmmeter is an electronic instrument, which is widely used to check a complete circuit or to measure the resistance of a circuit element. Micro Ohmmeter, Mega Ohmmeter and Milli - Ohmmeters are used to measure resistance in different applications of electrical testing.</p> <p>Micro Ohmmeter is a small portable device, which is used to measure voltage, current and test diodes. Mega Ohmmeter is used to measure large resistance values. Milli Ohmmeter is used to measure low resistance at high accuracy confirming the value of any electrical circuit.</p>

<p>3.</p> 	<p>c) Voltmeter is a voltage meter. Which measures the voltage between the two nodes.</p> <p>The main principle of voltmeter is that it must be connected in parallel in which we want to measure the voltage. Parallel connection is used because a voltmeter is constructed in such a way that it has a very high value of resistance.</p>
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## II. Read the text and answer the questions.

### Electrical Measuring Units and Instruments

Any instrument which measures electrical values is called a meter. An ammeter measures the current in amperes. The unit is named after Andre Marie Ampere, a French scientist. A voltmeter measures the voltage and the potential difference in volts. The volt is named after Alessandro Volta, an Italian scientist.

The current in a conductor is determined by two things, the voltage across the conductor. The unit by which resistance is measured is called the ohm. The resistance in practice is measured with the ohmmeter, a wattmeter measures electrical power in watts. Very delicate ammeters are often used for measuring very small currents. Whenever an ammeter or voltmeter is connected to a circuit to measure electric current or potential difference the ammeter must be connected in series and the voltmeter in parallel.

1. What does an ammeter measure?

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2. Was Andre m. ampere a French or Italian scientist?

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3. How is the current in a conductor determined?

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4. What is the unit called by which resistance is measured?

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5. Does a wattmeter measure electrical power?

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6. How does an ammeter measure electric current?

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## III. Find the English equivalents in the text:

1. Называется счетчиком - \_\_\_\_\_
2. Назван в честь кого-либо - \_\_\_\_\_
3. Ток в проводнике - \_\_\_\_\_
4. Сопротивление проводника - \_\_\_\_\_
5. Электрическая мощность - \_\_\_\_\_
6. Очень чувствительные - \_\_\_\_\_
7. Часто используются - \_\_\_\_\_
8. Измерять электрический ток - \_\_\_\_\_
9. Потенциальная разница - \_\_\_\_\_

## Unit 2. Resistors

### I. Read the text, write out the highlighted words and translate them:

#### Resistor Basics

**Resistors** are electronic components which have a specific, **never-changing** electrical **resistance**. The resistor's resistance **limits the flow** of electrons through a **circuit**.

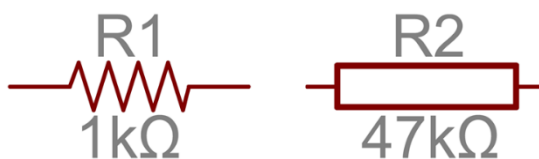
They are passive components, meaning they only **consume** power (and can't generate it). Resistors are usually **added** to circuits where they **complement** active components like microcontrollers and other integrated circuits. Commonly resistors are used to limit **current**, divide voltages, and pull-up I/O lines.

#### Resistor units

The electrical resistance of a resistor **is measured** in ohms. The symbol for an ohm is the **Greek** capital-omega:  $\Omega$ . The **definition** of  $1\Omega$  is the resistance between two points where 1 volt (1V) of **applied** potential energy will push 1 ampere (1A) of current.

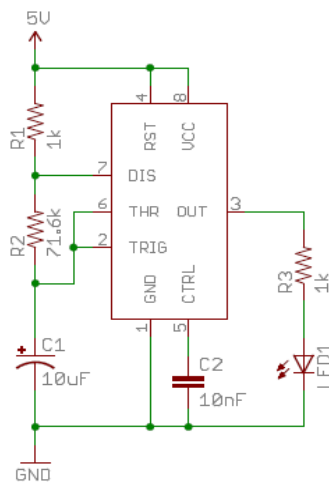
#### Schematic symbol

All resistors have two **terminals**, one **connection** on each end of the resistor. When **modeled** on a schematic, a resistor will show up as one of these two symbols:





The terminals of the resistor are each of the lines **extending** from the **squiggle** (or **rectangle**). Those are what connect to **the rest of** the circuit.



The resistor circuit symbols are usually **enhanced** with both a resistance **value** and a name. The value, **displayed** in ohms, is critical for both **evaluating** and actually constructing the circuit. The name of the resistor is usually an **R preceding** a number. Each resistor in a circuit should have a unique name/number. For example, here is a few resistors in action on a 555-timer circuit.

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## II. Translate the words:

- Resistor - \_\_\_\_\_,
- electrical component - \_\_\_\_\_,
- electric current - \_\_\_\_\_,
- source of power - \_\_\_\_\_,
- limit the flow of electric current - \_\_\_\_\_,
- voltage division - \_\_\_\_\_,
- heat generation - \_\_\_\_\_,
- matching and loading circuits - \_\_\_\_\_,
- control gain - \_\_\_\_\_,
- conductive material - \_\_\_\_\_,
- potential difference - \_\_\_\_\_,
- to balance out - \_\_\_\_\_,
- a trouble - \_\_\_\_\_,

to get open - \_\_\_\_\_,  
 current-carrying capacity - \_\_\_\_\_,  
 constant value - \_\_\_\_\_,  
 fixed resistor - \_\_\_\_\_,  
 variable resistor - \_\_\_\_\_.

### III. Match the questions and the answers.

1. What is a resistor?	A. In the USA, this is a zigzag line.
2. What are the graphical symbols of resistors?	B. The value of a fixed resistor is constant, while the value of a variable resistor is varied.
3. The international IEC symbol is a rectangular shape.	C. A resistor is a passive electrical component.
4. When does the temperature of a resistor rise?	D. The international IEC symbol is a rectangular shape.
5. When does a resistor get open?	E. It results in an open circuit.
6. What does an open resistor results in?	F. There are fixed resistors and variable resistors.
7. How are resistors rated?	G. When current passes through a resistor its temperature rises.
8. What types of resistors are there?	H. A faulty resistor should be replaced.
9. What is the difference between a fixed resistor and a variable resistor?	I. Resistors are rated in Ohms.
10. What should be done if a resistor is faulty?	J. A resistor gets open when the temperature rises higher than a maximum.

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**IV. Complete the dialogue. Use the words from the box.**

<i>in series</i>	<i>upgrading</i>	<i>resistor</i>	<i>circuit</i>
<i>problem</i>	<i>code</i>	<i>connect</i>	<i>consumption</i>

**Sam:** Hi!

**Mike:** Hi! Have you finished \_\_\_\_\_ your bike?

**Sam:** Not yet. I've got a \_\_\_\_\_.

**Mike:** Can I help you?

**Sam:** I'd like to \_\_\_\_\_ four 1.9V LEDs \_\_\_\_\_. It makes 20mAmps DC. What \_\_\_\_\_ should I use?

**Mike:** Well... I think you'd better use 220 Ohm resistor. You can define it according to the color \_\_\_\_\_: red-red-black-black-gold.

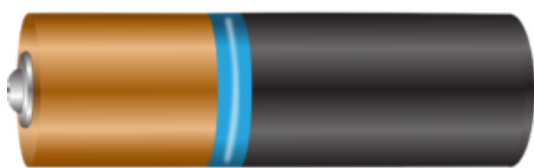
**Sam:** What about power \_\_\_\_\_? How much it will be?

**Mike:** The power consumption of the whole \_\_\_\_\_ will equal 240mW, and the current will be 20mAmps.

**Sam:** Great! That's what I need. Thank you!

**Mike:** You are welcome. See you!

**Sam:** Bye.

**Unit 3. Electric Cells****I. Read and translate the text.****Electric Cells**

An electric cell is something that provides electricity to different devices that are not fed directly or easily by the supply of electricity. It has two terminals. One is the positive terminal and another one is the negative terminal.

Cells can be connected in series, in parallel and in series-parallel. In order to increase the current capacity cells should be connected in parallel. In order to increase the voltage output cells should be connected in series. In case a battery has a large current capacity and a large voltage output, its cells are connected in series-parallel.

When cells are connected in series the positive terminal of one cell is connected to the negative terminal of the second cell, the positive terminal of the second cell —

to the negative terminal of the third... and so on. When cells are connected in parallel their negative terminals are connected together and their positive terminals are also connected.

In case a cell has a trouble it stops operating or operates badly. This cell should be substituted by another one.

## II. Translate sentences from Russian into English.

1. Элемент питания используется для производства электрической энергии. Он состоит из электролита и двух электродов.

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2. Электроды используются как терминалы, они присоединяют элемент питания к цепи – ток проходит через терминалы, и лампочка загорается.

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3. Элементы питания могут соединяться последовательно, параллельно и последовательно-параллельно.

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4. Чтобы увеличить силу тока, элементы питания должны соединяться параллельно.

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5. Чтобы увеличить напряжение, элементы питания должны соединяться последовательно.

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**III. Answer the following questions.**

1. What is a cell used for? \_\_\_\_\_
2. What does a cell consist of? \_\_\_\_\_
3. What is the function of the terminals? \_\_\_\_\_
4. In what way are cells connected in order to increase the voltage output? \_\_\_\_\_
5. In what way are cells connected in order to increase the current capacity? \_\_\_\_\_
6. In what way are the terminals of series cells connected? \_\_\_\_\_
7. In what case does a cell stop operating? \_\_\_\_\_
8. What should be done in case it stops operating? \_\_\_\_\_

**IV. Agree or disagree.**

1. A bulb has two terminals.
2. The bulb has a spirally wound wire, filament, inside it.
3. Two thick wires at the ends support this filament.
4. An electric cell is connected to the terminals of the bulb.
5. Hence, electricity from it passes through the bulb.
6. The filament in the bulb glows and emits light. This is because the circuit is not complete now.
7. Just under the plus sign, an electric cell has a cap. This is the negative terminal.
8. At the other end, just above the disc, there is a flat metallic disc with a minus sign which is known as the positive terminal.
9. These positive and negative terminals of the cell are important because these can be used to connect it to various devices.
10. To provide electricity to the device it is connected to this chemical that helps it.

**Unit 4. Capacitors****I. Read the text and match the words with their Russian equivalents.**

## Capacitors

A capacitor is an electrical device for storing quantities of electricity. The general form of a capacitor is what of two parallel conducting plates. A capacitor is a two-terminal, electrical component. Along with resistors and inductors, they are one of the most fundamental passive components we use. You would have to look very hard to find a circuit which didn't have a capacitor in it.

Such plates are of relatively large area, close together, and contain between them a non-conducting medium called the dielectric common dielectric are air, glass, oil and waxed paper.

To increase the capacitance of a capacitor the following changes can be made: first, the area of the plates may be increased.

Second, the plates may be put closer together

Third, a more suitable dielectric may be inserted between the plates.

If the plates of a capacitor are small in area and far apart, the capacitance is small. If the area is large and plates close together, the capacitance is large. The unit of capacitance, the farad, named in honor of Michael Faraday scientist a capacitance of 1 farad is very large and for practical purposes is not used.

The microfarad is more convenient. Capacitors in common use today are of various kinds, sizes and shapes. Perhaps the most common is the so-called «paper capacitor» used in radios and the ignition system of automobiles another type of capacitor is the variable capacitor commonly used in tuning radios.

1. Capacitor	a) количество
2. Capacitance	b) прибор; устройство
3. Device	c) изменчивый
4. Quantity	d) конденсатор
5. Plate	e) воздух
6. Air	f) ёмкость; ёмкостное сопротивление
7. Glass	g) пластина
8. Waxed paper	h) цель
9. Area	i) стекло
10. Purpose	j) различный
11. Various	k) площадь
12. Variable	l) относительный
13. Relative	m) пропитанная воском бумага

**II. Translate the words:**

Quantity - \_\_\_\_\_,  
 Contain - \_\_\_\_\_,  
 Conduct - \_\_\_\_\_,  
 Measure - \_\_\_\_\_,  
 Differ - \_\_\_\_\_,  
 Vary - \_\_\_\_\_,  
 Insulate - \_\_\_\_\_,  
 Store - \_\_\_\_\_,  
 Attract - \_\_\_\_\_,  
 Electric - \_\_\_\_\_.



**III. There are all sorts of capacitor types out there, each with certain features and drawbacks which make it better for some applications than others. Match the certain features of capacitors with their definitions:**

Size	Each capacitor is rated for a maximum voltage that can be dropped across it. Some capacitors might be rated for 1.5V, others might be rated for 100V. Exceeding the maximum voltage will usually result in destroying the capacitor.
Leakage current	Size both in terms of physical volume and capacitance. It's not uncommon for a capacitor to be the largest component in a circuit. They can also be very tiny. More capacitance typically requires a larger capacitor.
Equivalent series resistance (ESR)	Capacitors also can't be made to have an exact, precise capacitance. Each cap will be rated for their nominal capacitance, but, depending on the type, the exact value might vary anywhere from $\pm 1\%$ to $\pm 20\%$ of the desired value.
Maximum voltage	Capacitors aren't perfect. Every cap is prone to leaking some tiny amount of current through the dielectric, from one terminal to the other. This tiny current loss (usually nanoamps or less) is called leakage. Leakage causes energy stored in the capacitor to slowly, but surely drain away.
Tolerance	The terminals of a capacitor aren't 100% conductive,

	they'll always have a tiny amount of resistance (usually less than $0.01\Omega$ ) to them. This resistance becomes a problem when a lot of current runs through the cap, producing heat and power loss.
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**IV. Find the correct variant. Circle it:**

1. A capacitor is used

- a) to supply voltage
- b) to increase the voltage output
- c) to store energy

2. The main parts of a capacitor are

- a) insulators only
- b) metal plates only
- c) metal plates and insulators between them

3. The function of insulators is

- a) to store energy
- b) to isolate the metal plates
- c) to prevent a short between the metal plates

4. The capacity of a capacitor depends on

- a) the size of the plates
- b) the distance between the plates
- c) the material of the insulators

5. The capacity of a fixed capacitor

- a) is constant
- b) is varied

6. The plates of a variable capacitor

- a) can be moved
- b) cannot be moved

7. In order to charge a capacitor a voltage source is applied

- a) to the metal plates
- b) to the insulators



8. The greater the distance between the plates

- a) the greater the capacity of a capacitor
- b) the less the capacity

9. Variable capacitors have

- a) air insulators
- b) paper insulators
- c) ceramic insulators

10. Electrolyte capacitors have

- a) a very low capacity
- b) a very high capacity

11. In case a capacitor has a trouble

- a) it operates
- b) it stops operating

#### **V. Answer the following questions:**

1. What is a capacitor used for? \_\_\_\_\_
2. What are the main parts of a capacitor? \_\_\_\_\_
3. What is the function of insulators? \_\_\_\_\_
4. What does the capacity of a capacitor depend on? \_\_\_\_\_
5. What is the difference between a fixed capacitor and a variable one?  
\_\_\_\_\_
6. What should be done in order to change a capacitor? \_\_\_\_\_
7. What is the relation between the value of capacity and the distance of plates?  
\_\_\_\_\_
8. What type of insulators have variable capacitors? \_\_\_\_\_
9. What should be done in case a capacitor has a trouble? \_\_\_\_\_

### **Unit 5. Conductors and insulators**

#### **I. Read and translate the text.**

##### **Conductors and Insulators**

Conductors are materials having a low resistance so that current easily passes through them. The lower the resistance of the material, the more current can pass through it. Copper is widely used to produce wire conductors. Since copper wire

conductors have a very low resistance a minimum voltage drop is produced in them. Thus, all of the applied voltage can produce current in the load resistance.

Materials having a very high resistance are called insulators. Current passes through insulators with great difficulty.

The most common insulators are air, paper, rubber, plastics. Currents of great value must be applied to insulators in order to make them conduct.

Insulators have the two main functions:

1. to isolate conducting wires and thus to prevent a short between them and
2. to store electric charge when a voltage source is applied

## II. Fill in the blanks with the words and phrases:

*A bare wire, poles, electrical engineering, insulation, opposition, to resist, similar, turned off, air, cord, covers, glasses, leak off, rubber, socket, is transmitted.*

1. A \_\_\_\_\_ is a small insulated cable.
2. We need \_\_\_\_\_ for a chemical experiment.
3. When the temperature rises \_\_\_\_\_ to the passing current increases.
4. \_\_\_\_\_ is a perfect insulator.
5. If the switch is \_\_\_\_\_ the current does not flow.
6. \_\_\_\_\_ is a poor conductor electricity.
7. \_\_\_\_\_ is a wire not covered with insulated material.
8. We study \_\_\_\_\_.
9. If a wire is covered with \_\_\_\_\_ it is called an insulated wire.
10. Any magnet has two \_\_\_\_\_ .
11. Some liquids have \_\_\_\_\_ properties.
12. Electricity \_\_\_\_\_ by wires.
13. The train \_\_\_\_\_ a great distance from Moscow to Sevastopol.
14. If there is no insulation the current can \_\_\_\_\_ the conductor.
15. We shall consider the ability of insulators \_\_\_\_\_ the current flow.
16. Copper wires connect electrical devices to the \_\_\_\_\_ .

## III. Fill in the table with following words.

*Silver, rubber, diamond, gold, oil, copper, steel, sea water, glass, oil, dry wood*

Five electrical conductors	Five electrical insulators


#### IV. Complete the sentences from the box.

*resistance, conductors, resistance, applied, increases, difficulty*

1. Conductors have a low \_\_\_\_\_
2. Current passes through insulators with great \_\_\_\_\_
3. Metals are common \_\_\_\_\_
4. Carbon decreases its resistance when the temperature \_\_\_\_\_
5. Metals have a positive temperature coefficient of \_\_\_\_\_
6. To make insulators conduct, currents of great value must be \_\_\_\_\_

#### V. Correct the sentences using True or False

1. Insulators are materials having high resistance. \_\_\_\_\_
2. Current passes through conductors with great difficulty. \_\_\_\_\_
3. Copper and silver are common insulators. \_\_\_\_\_
4. Air, paper and plastics are common insulators. \_\_\_\_\_
5. Insulators are used to store electric charge and to prevent a short between conducting wires. \_\_\_\_\_

### Unit 6. Communication. Telecommunication.

#### I. Read the text and match the words with their Russian equivalents.

##### Communication. Telecommunication.

Communication is the process of exchanging information. People exchange information using communication means. Communication has always some purpose. Mass communication, for example, sends messages for masses of people.

The history of communication means is a long and interesting one. Communication through electric media. At the beginning of the 19th century the electric revolution made great progress. By 1832 (the telegraph had been invented. Wires crossed the continents and cables were put under the Atlantic Ocean. Some 40 years later (in 1876) the telephone was patented.

Messages began to be transmitted over electrical currents carried by wires. “Early radio”. At the beginning of the 20th century it became possible to transmit messages without wires. Messages were sent by wireless telegraph that is now called “early radio”. But modern radio became possible only when a vacuum tube had been invented (1906). Soon after the invention of tubes, radio receivers began to be widely used in the world.

Telecommunication is the transmission of information by various types of technologies over wire, radio, optical or other electromagnetic systems. It has its origin in the desire of humans for communication over a distance greater than that feasible with the human voice, but with a similar scale of expediency; thus, slow systems (such as postal mail) are excluded from the field.

- |              |                           |
|--------------|---------------------------|
| 1. area      | a. снабжать               |
| 2. provide   | b. удалённый, отдалённый  |
| 3. single    | c. данные                 |
| 4. remote    | d. территория, площадь    |
| 5. transmit  | e. один; единственный     |
| 6. instantly | f. доставлять, передавать |
| 7. receive   | g. принимать              |
| 8. outer     | h. немедленно, тотчас     |
| 9. deliver   | i. внешний, наружный      |
| 10. data     | j. передавать             |
| 11. access   | k. вовлекать              |
| 12. involve  | l. доступ                 |

## II. Read the transcription and write the words.

['ækses]	['eəriə]	['beɪsɪs]
[entə'teɪnmənt]	['brɔːdkaːst]	['dɪstəns]
[ɪn'vɒlv]	[telɪkəmjuːnɪ'keɪʃnz]	[kɒnvə'seɪʃn]
['ɪnstəntli]	[kəmjuːnɪ'keɪʃn]	[kə'mjuːnɪkeɪt]
[kən'vɜːt]	['deɪtə]	[dɪ'lɪvə]

## III. Match the words with their definitions

1. telecommunications	a. the distribution of audio and video content to a dispersed audience via radio, television, or other, often digital transmission media.
2. point-to-multipoint communication	b. information which is sent from a source to a

<p>3. point-to-point communication</p> <p>4. message</p> <p>5. broadcast</p>	<p>receiver.</p> <p>c. communication which is accomplished via a specific and distinct type of multipoint connection, providing multiple paths from a single location to multiple locations.</p> <p>d. a connection restricted to two endpoints.</p> <p>e. the transmission of messages, over significant distances.</p>
--	--

#### IV. Match the words with the opposite meaning.

- |               |                |
|---------------|----------------|
| 1. ease       | a. dissimilar  |
| 2. conductor  | b. to close    |
| 3. difficult  | c. to turn off |
| 4. large      | d. long        |
| 5. short      | e. thick       |
| 6. certainly  | f. to permit   |
| 7. to turn on | g. insulator   |
| 8. like       | h. difficulty  |
| 9. to break   | i. easy        |

#### V. Use the verbs in the appropriate form:

<p>1. Telecommunications are devices and systems that _____ electronic or optical signals across long distances.</p>	<p>Transmit</p> <p>Enable</p>
<p>2. Telecommunications _____ people around the world to contact one another, to access information instantly, and to communicate from remote areas.</p>	<p>Involve</p>
<p>3. Telecommunications usually _____ a sender of information and one or more recipients linked by a technology, such as a telephone system, that _____ information from one place to another.</p>	<p>Transmits</p> <p>Provide</p>
<p>4. It also _____ the key medium for delivering news, data, information, and entertainment.</p>	<p>Convert</p>
<p>5. Telecommunications devices _____ different types</p>	

<p>of information, such as sound and video, into electronic or optical signals.</p> <p>6. Electronic signals typically _____ along a medium such as copper wire or are carried over the air as radio waves.</p>	Travel
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## VI. Fill in the blanks with the appropriate words.

1. Telecommunications are devices and systems that \_\_\_\_\_ electronic or optical signals across long distances. 2. Telecommunications usually involve a sender of information and one or more \_\_\_\_\_ linked by a technology. 3. The messages can be \_\_\_\_\_ from one sender to a single receiver or from one sender to many \_\_\_\_\_. 4. Point-to-multipoint telecommunications \_\_\_\_\_ the basis for commercial radio and television programming. 5. Telecommunications devices \_\_\_\_\_ different types of information, such as sound and video, into electronic or optical signals. 6. Telecommunications messages can be sent by \_\_\_\_\_ of devices. 7. Electronic signals typically \_\_\_\_\_ along a medium such as copper wire or are \_\_\_\_\_ over the air as radio waves.

## Unit 7. Transmission Lines

### I. Read and translate the text.

#### Transmission Lines

A transmission line is used for the transmission of electrical power from generating substation to the various distribution units. It transmits the wave of voltage and current from one end to another. The transmission line is made up of a conductor having a uniform cross-section along the line. Air act as an insulating or dielectric medium between the conductors.

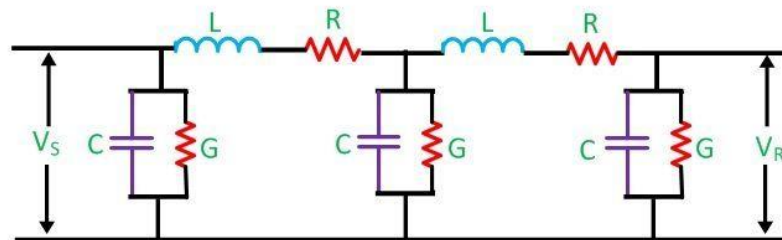
For safety purpose, the distance between the line and ground is much more. The electrical tower is used for supporting the conductors of the transmission line. Tower are made up of steel for providing high strength to the conductor. For transmitting high voltage, over long



distance high voltage direct current is used in the transmission line.

### Parameters of transmission line

The performance of transmission line depends on the parameters of the line. The transmission line has mainly four parameters, resistance, inductance, capacitance and shunt conductance. These parameters are uniformly distributed along the line. Hence, it is also called the distributed parameter of the transmission line.



Transmission Line Model

$$Z = R + j\omega L, Y = G + j\omega C$$

Circuit Globe

The inductance and resistance form series impedance whereas the capacitance and conductance form the shunt admittance.

## II. Match some critical parameters of transmission line with their definitions.

1. Line inductance	A. Air act as a dielectric medium between the conductors. When the alternating voltage applies in a conductor, some current flow in the dielectric medium because of dielectric imperfections. Such current is called leakage current. Leakage current depends on the atmospheric condition and pollution like moisture and surface deposits.
2. Line capacitance	B. In the transmission lines, air acts as a dielectric medium. This dielectric medium constitutes the capacitor between the conductors, which store the electrical energy, or increase the capacitance of the line. The capacitance of the conductor is defined as the present of charge per unit of potential difference.
3. Shunt conductance	C. The current flow in the transmission line induces the magnetic flux. When the current in the transmission line changes, the magnetic flux also varies due to which

	emf induces in the circuit. The magnitude of inducing emf depends on the rate of change of flux. Emf produces in the transmission line resist the flow of current in the conductor, and this parameter is known as the inductance of the line.
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### III. Read the transcription and write the words.

[lɪŋk]	['reɪndʒ]	['aʊtə]
['mesɪdʒ]	['pɔɪnt]	[prə'vaɪd]
[rɪ'si:v]	[rɪ'sɪpɪənt]	[rɪ'məʊt]
[trænz'mɪt]	['sɪŋɡl]	['sendə]
[mʌl'trɔɪnt]	[waɪd]	[və'raɪəti]

### IV. Match the words with their Russian equivalents.

1. to conduct	A. внутренняя (внешняя) антенна
2. to differ	B. провод; корд
3. to insulate	C. вести, проводить
4. to support	D. изолировать, предохранять
5. to include	E. различать, отличать
6. area	F. поддерживать
7. bus	G. заключать в себе, содержать
8. cord	H. проводящая поверхность
9. difference frequence	I. площадь, район, область
10.indoor (outdoor) aerial	J. шина
11.conducting surface	K. разностная частота

### V. Translate the sentences from Russian into English.

1. Система власти взаимосвязь электрических станций на высоковольтных линиях электропередачи.

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2. В настоящее время электроэнергия передается на большие расстояния и длины, мощности сигнала в линии варьируется от района к району.

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3. Провода системы называется линии электропередачи, в случае, если он не имеет параллельные ветки.

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4. В соответствии с их функциями, линий электропередач и сети подразделяются на магистральных и распределительных линий.

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5. Передача строки служат для выдачи мощности станции до распределительных центров.

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6. Воздушные линии включают в себя линии проводников и диэлектриков, которые подключены к опорам.

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## Unit 8. Cables

### I. Read and translate the text.

#### Cables

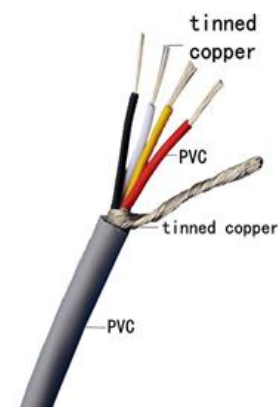
A cable that transmits information signals between geographically separated points. The heart of a communications cable is the transmission medium, which may be optical fibers, coaxial conductors, or twisted wire pairs. A mechanical structure protects the heart of the cable against handling forces and the external environment. The structure of a cable depends on the application.

Optical communications cables are used in both terrestrial and undersea systems. Optical communications cables for terrestrial use may be installed aerially, by direct burial, or in protective ducts. The terrestrial cable requires only enough longitudinal strength to support its own weight over relatively short pole-to-pole spans, or to allow installers to pull the cable into ducts or lay it in a trench. For the undersea cable, the high-strength steel strand allows it to be laid and recovered in ocean depths up to 4.5 mi (7315 m).

Optical communications cables are often used to carry input and output data to computers, or to carry such data from one computer to another. Then they are generally referred to as optical data links or local-area networks. The links are generally short enough that intermediate regeneration of the signals is not needed.

Signals in these cables are carried by light pulses which are guided down the optical fiber. In most applications, two fibers make up a complete two-way signal channel. Optical cable systems are usually digital.

Coaxial communication systems evolved before optical systems. Most of these systems are analog in nature. Signals are represented by the amplitude of a wave representing the signal to be transmitted. In a multichannel system, each voice, data, or picture signal occupies its unique portion of a broadband signal which is carried on a shared coaxial conductor or “pipe.”



## II. Use the words in the appropriate form.

1. A cable that _____ information signals between geographically separated points.	Transmit
2. A mechanical structure _____ the heart of the	Protects

<p>cable against handling forces and the external environment.</p> <p>3. The structure of a cable _____ on the application.</p> <p>4. Optical communications cables _____ in both terrestrial and undersea systems.</p> <p>5. The terrestrial cable _____ only enough longitudinal strength to support its own weight over relatively short pole-to-pole spans.</p> <p>6. For the undersea cable, the high-strength steel strand _____ it to be laid and recovered in ocean depths up to 4.5 mi (7315 m).</p> <p>7. Then they _____ generally referred to as optical data links or local-area networks.</p> <p>8. The _____ are generally short enough that intermediate regeneration of the signals is not needed.</p> <p>9. Signals in these cables _____ by light pulses which are guided down the optical fiber.</p>	<p>Depend</p> <p>Use</p> <p>Require</p> <p>Allow</p> <p>Be</p> <p>Link</p> <p>Carry</p>
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### III. Translate sentences from Russian into English:

1. Кабель передает информационные сигналы между географически разнесенными точками.

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2. Механическая конструкция защищает сердцевину кабеля от воздействий сил и внешней среды. Структура кабеля зависит от области применения.

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3. Кабели оптической связи используются как в наземных, так и в подводных системах.

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4. Кабели оптической связи для наземного использования могут быть проложены по воздуху или в защитных каналах.

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5. Кабели оптической связи часто используются для передачи входных и выходных данных на компьютеры или для передачи таких данных с одного компьютера на другой.

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6. Сигналы в этих кабелях передаются световыми импульсами, которые проходят по оптическому волокну.

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#### **IV. Write down the distinctive features between a cable, a wire and a cord.**

A cable is a single core or several insulated conductors that are covered with a metal or non-metallic sheath, in addition, there may be protective covers (steel or aluminum tapes or wire).

Cords are always flat conductors (most often used in electrical wiring), that's why they differ from wires; the cable may have reinforced protective covers, and the wire or cord may include light covers;

A wire is a single core or several conductors that are insulated, twisted and coated with a non-metallic sheath. The shell can be replaced with light protective covers (braid from yarn, fiberglass).

Cord - two or three flexible parallel conductors in isolation, which are enclosed in a non-metallic sheath, which can be replaced by light protective covers.

Only the cable can be enclosed in a metal sheath (lead, aluminum)

All conductors are operated for the purpose of transporting electrical energy with certain characteristics from point A to point B under specified operating conditions.

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**V. Match some structural elements of a cable with their definitions.**

1. Insulation	A. conducting electric current with the minimum possible losses in the form of heating (requirements - high conductivity, low cost, corrosion resistance, flexibility without breaks)
2. Conductive core	B. creating a barrier to electrical energy by providing the greatest resistance (requirements - playing the role of a dielectric in the widest temperature range possible, flexibility, adaptability)
3. Screen	C. leveling of external electromagnetic interference (requirements - ease of manufacture, 100% coverage during bending)
4. Shell	D. additional insulation reducing the probability of breakdown
5. Belt insulation	E. performance of protective functions (counteraction to mechanical loads, atmospheric factors, ensuring tightness)
6. Protective cover	F. functions similar to the shell, but in more severe operating conditions

**Unit 9. Telephony**

**I. Read and translate the text.**

**Telephony**

Telephony is the field of technology involving the development, application, and deployment of telecommunication services for the purpose of electronic transmission of voice, fax, or data, between distant parties. The history of telephony is intimately linked to the invention and development of the telephone.



Telephony is commonly referred to as the construction or operation of telephones and telephonic systems and as a system of telecommunications in which telephonic equipment is employed in the transmission of speech or other sound between points, with or without the use of wires.

The term is also used frequently to refer to computer hardware, software, and computer network systems, that perform functions traditionally performed by telephone equipment. In this context the technology is specifically referred to as Internet telephony, or voice over Internet Protocol.

## II. Electronics deals with various specific notions and concepts. Some basic words are given below. Match the words with their definitions.

1. Engineering	A. the radiation of waves by transmitting stations, their propagation through space, and reception by receiving stations
2. A transistor	B. sending information from one point to another
3. Feedback	C. the activity of designing machines and devices
4. A vacuum tube	D. a piece of electronic equipment that increases the strength of sounds
5. Communication	E. a device with three or more electrodes that controls the flow of electricity inside a piece of electronic equipment
6. Radio	F. a closed glass tube without air inside used for controlling current

7. An amplifier	G. the high loud noise that electrical equipment makes when part of the sound it sends out goes back into it
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### III. True or False.

1. Mobile phones, or cellular phones, are devices that enable Communication to some types of telephones while moving over a wide area called the coverage area. \_\_\_\_\_
2. The term 'cellular' comes from the fact the phone calls are made through base stations, communication towers or antennas, which divide the coverage area into cells. \_\_\_\_\_
3. This capability of mobile phones is called roaming. \_\_\_\_\_
4. The phone is said to be in of range when it cannot communicate with a base station. \_\_\_\_\_
5. First Generation phones started in the 1980s when Motorola introduced the first hand-held phones. \_\_\_\_\_
6. In the 1990s, 2G mobiles introduced digital transmission methods that converted voice into binary information, increasing the number of channels, the speed of transmission between the phone and the base station enabling a reduction in size. \_\_\_\_\_
7. 3G phones offer a high-speed data transfer capability. Some of these phones are called smart phones and combine PDA capabilities with the usual functions of a digital phone. \_\_\_\_\_
8. New standards are being developed that will open the way to new 4G phones with an emphasis on multimedia, real-time television and radio. \_\_\_\_\_

### IV. Match the topics 1 - 8 to the texts A - G. Use each number once only. The task is one topic extra.

1. Not for children
2. Benefits for poor countries
3. Illegal and unsafe
4. Small size has a great role
5. One is not enough
6. It is better to text
7. Weighing lighter
8. Enjoy a lot of functions

**A.** A mobile phone (also known as a cell phone) is a device that can make and receive telephone calls while moving around. It does so by connecting to a cellular network provided by a mobile phone operator, allowing access to the public telephone network. In addition to telephony, modern mobile phones also support a wide variety of other services such as text messaging, MMS, e-mail, Internet access, Bluetooth, business applications, gaming and photography.

**B.** The first hand-held mobile phone was demonstrated by Dr Martin Cooper of Motorola in 1973, using a handset weighing around 1 kg. In 1983, the first commercial cell phone was released. In the twenty years from 1990 to 2010, worldwide mobile phone subscriptions grew from 12.4 million to over 4.6 billion. It got to the developing countries and reached the poorest citizens. The devices themselves have also become smaller and much lighter.

**C.** The most commonly used data application on mobile phones is SMS text messaging. The first SMS text message was sent from a computer to a mobile phone in 1992 in the UK, while the first person-to-person SMS from phone to phone was sent in Finland in 1993. The first mobile news service, delivered via SMS, was launched in Finland in 2000. Mobile news services are expanding with many organizations providing ‘on-demand’ news services by SMS.

**D.** Mobile phones need a small microchip called a Subscriber Identity Module, or SIM card, to function. The SIM card is approximately the size of a small postage stamp and is usually placed underneath the battery in the rear of the unit. The SIM card does not only store data like telephone numbers but also allows users to change phones by simply removing the SIM card from one mobile phone and inserting it into another mobile phone or broadband telephony device.

**E.** Mobile phones are used for keeping in touch with family members, conducting business, and having access to a telephone in an emergency. Some people carry more than one cell phone for different purposes, such as for business and personal use. Multiple SIM cards may also be used to take advantage of the benefits of different calling plans — a particular plan might provide cheaper local calls, long-distance calls, international calls, or roaming.

**F.** Mobile phones have spread more quickly than any other technology and can improve the life of the poorest people in developing countries. They provide access to information in places where landlines or the Internet are not available. In Africa, people travel from village to village to let friends and relatives know about



weddings and births. They need not do this if the villages are within coverage. Mobile phones are recharged using a solar panel or motorcycle battery.

**G.** Mobile phone use while driving is common but dangerous, as it increases the risk of accident. Many countries prohibit it. Some schools also limit or restrict the use of mobile phones because cell phones are used for cheating on tests, harassment and bullying, causing threats to the school's security. Many mobile phones are banned in school locker room facilities, public restrooms and swimming pools due to the built-in cameras that most phones now have.

**V. Electronics deals with various specific notions and concepts. Some basic words are given below. Match them up with the definitions on the right.**

1) Charge	A. The production of electrical or magnetic forces in an object by other electrical or magnetic forces near it.
2) Current	B. The amount of electricity that something holds or carries.
3) Electromagnetic wave	C. The distance that the wave moves during the time it takes for one complete cycle of vibration.
4) Induction	D. The process by which waves change when they pass over an object or through a narrow space.
5) Voltage	E. The flow of electricity.
6) Wavelength	F. To change frequently in size, strength, or direction between limits.
7) Frequency	G. A wave comprising both electrical and magnetic components, which are in phase, have the same frequency and located at right angles to one another.
8) Oscillate	H. The number of cycles per second.
9) Refraction	I. The process of throwing something (e.g., an image, sound) back.
10) Reflection	J. The amount of energy per charge between two points measured in volts.
11) Diffraction	K. The process of changing the direction of light when it hits a surface.

## Unit 10. Aerials

### I. Read and translate the text.

## Aerials

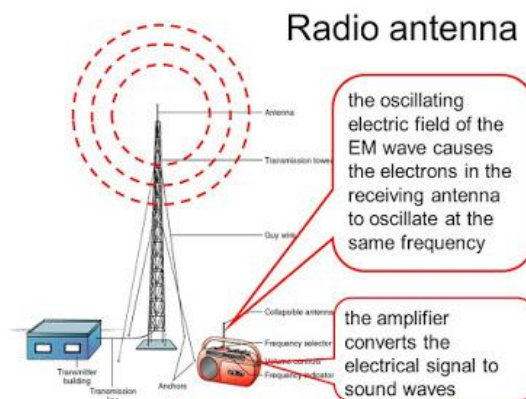
An *antenna* (or *aerial*) is an electrical device that converts electric power into radio waves, and vice versa. It is usually used with a radio transmitter or radio receiver. In transmission, a radio transmitter supplies an electric current oscillating at radio frequency (i.e. a high frequency alternating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

Typically an antenna consists of an arrangement of metallic conductors (elements), electrically 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. These time-varying fields radiate away from the antenna into space as a moving transverse electromagnetic field wave. Conversely, during reception, the oscillating electric and magnetic fields of an incoming radio wave exert force on the electrons in the antenna elements, causing them to move back and forth, 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 Clerk Maxwell. Hertz placed dipole antennas at the focal point of parabolic reflectors for both transmitting and receiving.

## II. The following sentences define some important words related to antennas.

### What are they?

1. The magnitude of change in the oscillating variable with each oscillation within an oscillating system.  
A pulse                      B peak                      C amplitude
2. A substance that allows heat or electricity to pass through it.  
A insulator                      B conductor                      C capacitor
3. An electromagnetic wave that radio signals can be sent on.  
A microwave                      B radio wave                      C infrared radiation
4. An electrical device, which converts electric power into radio waves, and vice versa.  
A antenna (aerial)                      B transformer                      C amplifier
5. A periodic current whose average value over a period is zero.  
A direct current                      B oscillating current                      C alternating current
6. A piece of electronic equipment used for generating and amplifying a radio-frequency carrier, modulating the carrier with information and feeding it to an aerial for transmission.  
A transmitter                      B transducer                      C generator
7. The process of varying one or more properties of a high-frequency periodic waveform, called the carrier signal, with respect to a modulating signal.  
A variation                      B modulation                      C demodulation
8. An electronic device that receives radio waves and converts the information carried by them to a usable form.  
A receiver                      B resistor                      C regulator
9. The process of extracting the original information-bearing signal from a modulated carrier wave.  
A reception                      B recovery                      C demodulation
10. A device comprising both a transmitter and a receiver, which are combined and share common circuitry or a single housing.  
A modem                      B transceiver                      C converter

## III. Read the extract about the etymology of radio and use the words in the box to complete the text.

*to radiate, networking, transceiver, transmission, broadcasts,*

*mobile communication*

Referring to antenna etymology, the prefix “aerial” in the sense of wireless 1).....was first used in the term “radio-conductor”. This word was coined by Edouard Branly, the French physicist, in 1897. It is based on the verb 2).....(in Latin “radius” means “spoke of a wheel, beam of light, ray”).

The United States Navy adopted the word “radio” in 1912 to distinguish it from several other wireless 3)..... technologies in use at that time.

The term had become common by the time of the first commercial 4) ....in the United States in the 1920s. (The noun “broadcasting” itself comes from the area of agriculture where it means “scattering seeds widely”).)

Later, the term was introduced to other languages in Europe and Asia. In recent years, the term “wireless” has gained renewed popularity due to the rapid growth of short-range computer 5)....., e.g. Wireless Local Area Network (WLAN), Wi-Fi and Bluetooth, as well as 6) .....telephony such as GSM and UMTS.

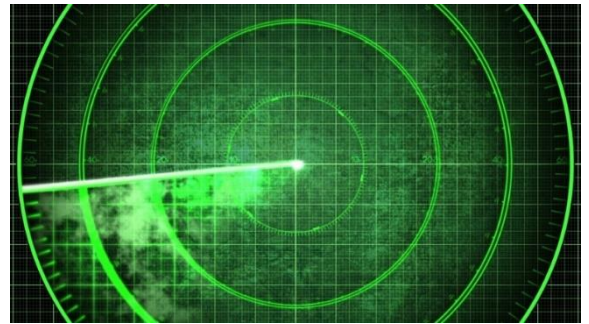
Today, the term “radio” often refers to the actual 7).....device or chip, whereas “wireless” matches the system and/or method used for radio communication.

#### IV. Match the words and translations.

1. application	A. звуковая частота
2. audio-frequency	B. радиопередающие и радиоприемные устройства
3. amplifier	C. радиотехника
4. achievement	D. приемник
5. radio-engineering	E. применение
6. radio transmitting and radio receiving devices	F. использовать электромагнитные волны
7. to employ electromagnetic waves	G. высокочастотный генератор
8. receiver	H. передатчик
9. transmitter	I. достижение
10. high-frequency oscillator	J. усилитель
11. transmitting station	K. приемная станция
12. receiving station	L. передающая станция

#### V. True or False

1. An antenna (or aerial) is an electrical device, which converts electrical currents into radio waves, and vice versa. \_\_\_\_\_
2. It is usually used with a radio transmitter or radio receiver. \_\_\_\_\_
3. In reception, an antenna intercepts some 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. \_\_\_\_\_
4. An antenna can't be used for both transmitting and receiving. \_\_\_\_\_
5. Once generated, electromagnetic waves either travel without space directly, or have their path altered by reflection, refraction or diffraction. \_\_\_\_\_
6. The intensity of the waves diminishes due to geometric dispersion (the inverse-square law); some energy may also be absorbed by the intervening medium in some cases. \_\_\_\_\_
7. Noise won't generally alter the desired signal; this electromagnetic interference comes from natural sources, as well as from artificial sources such as other transmitters and accidental radiators. \_\_\_\_\_
8. Noise is also produced at every step due to the inherent properties of the devices used. \_\_\_\_\_



## Unit 11. Radars

### I. Read and translate the words.

#### Radar

The word “radar” means Radio Determination and Ranging. Radar equipment is capable of determining by radio echoes the presence of objects, their direction, range and recognizing their character. Radar detects objects at a distance by reflecting radio waves off them. The delay caused by the echo measures the distance. The direction of the beam determines the direction of the reflection. The polarization and frequency of the return can sense the type of surface.

There are several types of radar sets, all of them consisting of six essential components, namely: a transmitter, a receiver, an antenna system, an indicator, a timer and, of course, a power supply.

A radar set detects by sending out short powerful pulses of ultra-high frequency radio wave energy from a high power transmitter. The directional antenna takes this energy from the transmitter and radiates it in a beam (similar to that of a searchlight). As the transmitted energy strikes an object, a portion of it is reflected back. The receiver picks up the returning echo through its antenna and translates it into visual readable signals on a fluorescent screen. The appearance of these signals show the presence of an object within the field of view of radar.

Navigational radars scan a wide area two to four times per minute. They use very short waves that reflect from earth and stone. They are common on ships and long-distance aircraft. General-purpose radars generally use navigational radar frequencies, but modulate and polarize the pulse so the receiver can determine the type of surface of the reflector. Search radars scan a wide area with pulses of short radio waves and sometimes use the Doppler effect to separate moving vehicles from clutter. Weather radars can even measure wind speed.

## II. Master the following words.

To impress	внедрять, печатать
to disturb	беспокоить, создавать помехи
hum	гудение, гул
hiss	шипение
whistle	свист
statics	атмосферные помехи
steady	устойчивый, постоянный
poor	слабый, бедный
therefore	поэтому, следовательно

## III. Answer the questions.

1. What is the basic principle of radar? \_\_\_\_\_
2. What is radar as a system of communication used for? \_\_\_\_\_
3. What function does a movable aerial perform? \_\_\_\_\_
4. What device was the radar technique extended to? \_\_\_\_\_
5. How is modulation defined? \_\_\_\_\_
6. What is the meaning of the abbreviation "radar"? \_\_\_\_\_
7. What kind of waves does radar employ? \_\_\_\_\_

**IV. Match the words with their definitions.**

- |                          |  |
|--------------------------|--|
| 1) propagate             | a) apparatus for receiving signals       |
| 2) transmitter           | b) create something new                  |
| 3) radar                 | c) a piece of equipment which emits      |
| 4) receiver radio waves  | d) electronic impulse in radio, TV, etc. |
| 5) source                | e) a system that uses radio waves to     |
| 6) frequency             | f) number of repetitions in a given time |
| 7) invent detect objects | g) spread more widely                    |
| 8) signal                | h) place from which something comes      |

**IV. Say if the following statements are true or false. Correct the false ones.**

1. Radar is a system that uses radio waves for detecting and mapping objects.  
\_\_\_\_\_
2. A transmitter emits radio waves which are reflected by the target and detected by a receiver in the different location as the transmitter. \_\_\_\_\_
3. The term RADAR was coined in 1947. \_\_\_\_\_
4. A radar system emits powerful pulses of radio waves and listens for any echoes. \_\_\_\_\_
5. By analyzing the received signal, the reflector can be located and sometimes identified. \_\_\_\_\_
6. Although radio waves can be easily generated at any desired strength, the amplitude of the signal returned is usually very large. \_\_\_\_\_
7. Radio waves can't propagate through clouds, fog, or smoke. \_\_\_\_\_

**IV. Translate from Russian into English**

1. Радиоволны, испускаемые передатчиком, отражаются целью и обнаруживаются приемником.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. Возвращаемый радиосигнал обычно очень слаб.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Радар используется в метеорологии, дорожной полицией для определения скорости движения транспорта, в авиации, а также вооруженными силами.

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4. Анализируя отраженный сигнал, можно определить местонахождение отражателя.

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5. Радиосигналы могут быть легко обнаружены и усилены во много раз.

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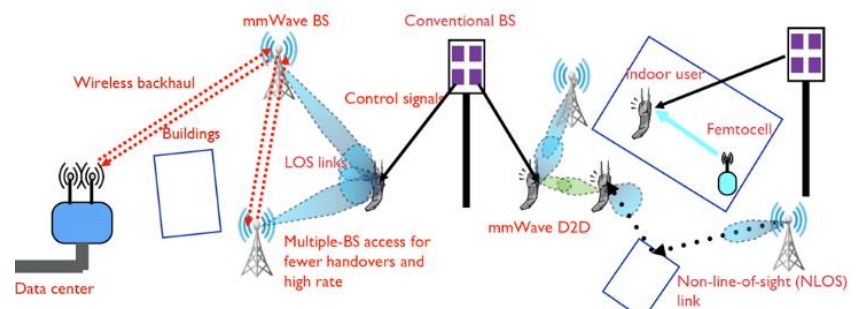
## Unit 12. Radio interference

### I. Read and translate the text.

#### Radio interference

Most new radio systems are digital, including Digital TV, satellite radio, and Digital Audio Broadcasting. The oldest form of digital broadcast was spark gap telegraphy, used by pioneers such as Marconi. By pressing the key, the operator could send messages in Morse code by energizing a rotating commutating spark gap. The rotating commutator produced a tone in the receiver, where a simple spark gap would produce a hiss, indistinguishable from static. Spark-gap transmitters are now illegal, because their transmissions span several hundred megahertz. This is very wasteful of both radio frequencies and power.

The next advance was continuous wave telegraphy, or CW (Continuous Wave), in which a pure radio frequency, produced by a vacuum tube electronic oscillator was switched on and off by a key. A receiver with a local oscillator would "heterodyne" with the pure radio frequency,





creating a whistle-like audio tone. CW uses less than 100 Hz of bandwidth. CW is still used, these days primarily by amateur radio operators (hams). Strictly, on-off keying of a carrier should be known as "Interrupted Continuous Wave», ICW, or on-off keying (OOK).

Radio teletype equipment usually operates on short-wave (HF) and is much loved by the military because they create written information without a skilled operator. They send a bit as one of two tones using frequency-shift keying. Groups of five or seven bits become a character printed by a printer. From about 1925 to 1975, radio teletype was how most commercial messages were sent to less developed countries. These are still used by the military and weather services.

Aircraft use a 1200-Baud radio teletype service over VHF to send their ID, altitude and position, and get gate and connecting-flight data. Microwave dishes on satellites, telephone exchanges and TV stations usually use quadrature amplitude modulation (QAM). QAM sends data by changing both the phase and the amplitude of the radio signal. Engineers like QAM because it packs the most bits into a radio signal when given an exclusive (non-shared) fixed narrowband frequency range. Usually the bits are sent in "frames" that repeat. A special bit pattern is used to locate the beginning of a frame.

## II. Fill in the gaps, choose the right words.

1. Radio occupies one of the leading places among the greatest achievements of modern \_\_\_\_\_
  - a) currents;
  - b) receiver;
  - c) engineering.
2. The energy is radiated into space from the \_\_\_\_\_ by the antenna.
  - a) receiver;
  - b) transmitter;
  - c) amplifier.
3. To \_\_\_\_\_ means to make bigger or enlarge.
  - a) amplify;
  - b) transmit;
  - c) radiate.
4. A transmitting antenna \_\_\_\_\_ radio waves.
  - a) receives;
  - b) reaches;

c) radiates.

5. Our scientists have great \_\_\_\_\_ in the field of radio and television.

- a) achievements;
- b) currents;
- c) oscillations.

6. Radio finds a wide \_\_\_\_\_ in many spheres of our life.

- a) application;
- b) achievement;
- c) transmission.

7. Any radio receiver has five fundamental \_\_\_\_\_

- a) transmitters;
- b) components;
- c) oscillators.

8. Broadcast stations often use two or more \_\_\_\_\_

- a) currents;
- b) antennas;
- c) electrons.

**III. Are the following statements true or false? If they are false, explain why.**

1. The transmission of signals by radio is feasible only through wires.

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2. To carry information one of the features of radio waves is systematically changed or modulated.

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3. The number of components the radio system contains is different depending on the communication purpose.

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4. The transmitter sends signals without any processing.

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5. Radio broadcasting is performed by two methods known as amplitude modulation and frequency modulation.

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6. An aerial is an electronic device that is used for transmitting signals.

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7. The major function of a receiver is to select a wanted radio signal and demodulate it into a usable form.

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8. At present radio does not play any significant role since the technology is outdated.

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**IV. Match topics 1 to 8 to texts A to G. Use each number only once. The task is one topic extra.**

1. Radio system components.
2. Types of modulation.
3. Radio and its purpose.
4. Radio applications.
5. An antenna and its importance.
6. A transmitter and the principles of its operation.
7. Wireless communications systems.
8. The function of a receiver.

**A.** Radio is the transmission of signals through free space by electromagnetic radiation of a frequency significantly below that of visible light, in the radio frequency range from 30 kHz to 300 GHz. These waves are known as radio waves. Electromagnetic radiation travels by means of oscillating electromagnetic fields that

pass through the air and the vacuum of space. Information is carried by systematically changing (modulating) a particular property of the radiated waves, such as their amplitude, frequency, phase or pulse width.

**B.** Radio systems used for communication include the following elements: a transmitter, an antenna, a receiver. A wide range of techniques can be applied for implementing each process, their use depending on the communications purpose.

**C.** A transmitter is one of the key components of the system. The transmitter contains a source of electrical energy producing alternating current of a required frequency and a system for modulating some property of the produced energy to impress a signal on it. This modulation might be as simple as turning the energy on and off, or altering more subtle properties such as amplitude, frequency, phase or combinations of these properties.

**D.** Radio uses two basic modulation techniques: amplitude modulation and frequency modulation. Amplitude modulation of a carrier wave works by varying the strength of the transmitted signal in proportion to the information being sent. For example, changes in the signal strength can be used to specify the sounds reproduced by a speaker or the light intensity of television pixels.

**E.** An antenna (or aerial) is an electric device, which converts electric current into radio waves, and vice versa. It is usually used with both a transmitter and receiver. In transmission, a radio transmitter applies an oscillating radio frequency current to the antenna terminals, and the antenna radiates this energy as electromagnetic waves. In reception, an antenna intercepts some of the electromagnetic wave power to generate a tiny voltage at its terminals that is applied to a receiver for amplifying.

**F.** A radio receiver picks up its input from an antenna, uses electronic filters to separate a required radio signal from all other signals captured by this antenna. Then, it amplifies the signal to a level suitable for further processing. Finally, the receiver converts the signal through demodulation and decoding into a form usable for the consumer, namely sound, pictures, digital data, measurement values, navigational position, etc.

**G.** Early radio systems relied entirely on the energy collected by an antenna to produce signals. Radio became more effective after the invention of the vacuum tube and later the transistor that allowed amplifying weak signals. The first uses of radio were maritime intended for sending telegraphic messages using Morse code

between ships and land. Nowadays radio takes various forms, including wireless networks and mobile communications, as well as radio broadcasting. Radio plays a significant role in the modern world due to a great number of its applications ranging from walkie-talkie children's toys to controlling space vehicles.

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