МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ

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(НВПК НИЯУ МИФИ)

РЕКОМЕНДАЦИИ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ

учебной дисциплины

ОГСЭ.03 Иностранный язык в профессиональной деятельности

для специальности

14.02.01 Атомные электрические станции и установки

Нововоронеж 2019 г.

Рекомендации к практическим занятиям по английскому языку носят контрольно-обучающий характер. Задания предназначены для проверки и развития грамматических навыков, лексического запаса и навыков чтения и перевода студентов специальности 14.02.01 Атомные электрические станции и установки.

Упражнения способствуют закреплению навыков использования различных лексико-грамматических структур и выявляют умение студента извлекать информацию из прочитанного текста по специальности на английском языке. Перед выполнением контрольных работ рекомендуется повторить грамматический материал и ответить на вопросы для контроля грамматических ЗУН. При выполнении контрольных заданий к тексту следует обращать внимание на специфический перевод технических терминов, явление конверсии и эмфатические конструкции

Electric Motors

1. a) Cover the right column and read the English words. Translate them into

['indastri] industry _____
I'saivis] service _____
[raenspot] transport _____
I'mouta] motor _____
['praektikal] practical_____
[pou'tenjal] potential _____

3. Give the Russian for:

magnet pole_____
different conduit _____ __
machine ratings _____ . _____ ---

Russian and check your translation.

b) Cover the left column and translate the Russian words back into English.

condition	условие
plant	завод
pole	полюс
	вращение, момент вращения
	бедный, плохой (заводская) табличка

2. Read the words and put down their Russian equivalents. Then translate them back into English.

rated torque

service life_____ ---
poor operation_____ . _____ .----------

4. Form adjectives and adverbs. Translate them into Russian.

a. care - careful _____ . --------
use -_____ ---------
power - _____ ------

b.care - careless _____ ----------

use -_____ ----------
power - _____ ----------
wire -_____. ----------

c.normal - normally _____ ----------

practical - _____. _____ .—. ----------

potential - _____----------

abnormal -_____ ----------

poor -_____----------

5. Answer these questions:

1. What types of magnets are used in heavy industry?
2. How long is motors' service life under normal conditions?
3. Are motors used in every branch of industry?
4. What are the main types of motors in use nowadays?

Electric Motors

Motors are used for converting different forms of energy into mechanical energy.

The main part of a motor is a coil or armature. The armature is placed between the poles of a powerful magnet. When a motor is put into operation current starts flowing through the coil (armature) and the armature starts rotating.

Electric motors are used practically in every branch of industry, transport, and agriculture. Naturally, they are produced in many different designs. They are used in industrial plants, and operate under different conditions.

Each motor is supplied with a nameplate which bears machine ratings: output power, voltage, the rated current, the starting current, the power factor, the efficiency, and the rated torque.

These motor ratings should be taken into consideration since they are necessary for the users. On them depends the length of motors' service life, which is normally equal to about 10 years, provided that the operating conditions are normal. Naturally, under abnormal conditions the service life becomes much shorter: motors operate poorly and may have different faults.

6. Complete the sentences using the correct variant:

1. Motors are used
   a) for transmitting energy.
   b) for converting energy.
2. Motor's main part is
   a) the frame.
   b)the armature.
   c)the stator.
3. The armature is placed
   a) between the poles of the magnet.

b) about the poles of the magnet.

4. Motors' service life becomes a) under normal conditions, shorter b) under abnormal conditions.

5. Faulty motors operate a) normally.
   b) poorly.

7. Answer these questions. Use them in a talk with your groupmate:
   1. What are motors used for?
   2. What is the motor's main part?
   3. Where is the armature placed?
   4. What ratings does the nameplate of a motor bear?
   5. Under what conditions does a motor operate normally (poorly)?
8. Read about energy resources of today. Write three questions about the text and ask your groupmate to answer them.

Energy Resources of Today

People are energy-rich today. Solar energy is considered to be a potentially limitless source of clean energy. The waters of the world contain potential fuel - in the form of a special isotope of hydrogen - deuterium. It is sufficient to power fusion reactors for thousands of years.

Faults of Motors and Ways of Their Repair

1. a) Cover the right column and read the English words. Translate them into Russian and check your translation.

   b) Cover the left column and translate the Russian words back into English.

	To repair- ремонтировать
	Brush- щетка
	Gap- зазор, люфт
repair	
slow (adj)	
	Spark- искра
	Speed- скорость

Noise- шум

Slow- медленный

Excessive- избыточный

Check- проверка

to adjust- регулировать, подгонять

Read the words and put down their Russian equivalents:

['komju:teit9] commutator _____

['steita) stator _____

['routa] rotor ['kontaekt]

ntact [kan'taekt] [prouses]

to

3. Put down the verbs corresponding to the given nouns and translate them:

heck

spar

4. Put down the Russian equivalents of these word combinations. Translate them back into English (orally).

air gap

brush sparks _____

slow speed excessive speed

safety devices _____

6. Answer these questions

7. What do motors' faults result from?
8. Are there any faults that can be ignored?
1. What makes motors' service life shorter?
2. What does voltage supply stop result in?
3. What processes show the (dis)advantages of devices?

6. Are the words: spark, short, slow, brush, fault, load, test nouns? Are they verbs? Translate the sentences into Russian:

1. New motors are given a no-load and under a load tests.
2. When the motor is tested it should produce no abnormal noise.
3. In case this noise appears the motor must be disconnected.
4. This generator must be checked; one should give it a test.
5. The motor's brushes seem to be sparking. Can you see the sparks?
6. The windings of the coil are shorted. I have detected a short in the windings.
7. The armature rotates slowly; let's check it up!
8. The speed of rotation is too excessive; it must be slowed down.

9. In case the rotor brushes against the stator, the motor operates slowly. The faulty brushes should be replaced.

Faults of Motors and Ways of Their Repair

Motors may have different faults. A faulty motor does not start, or, when it is started, it operates at an excessive speed.

Its brushes may spark and its windings and the commutator may be overheated and burnt. Besides, a motor may produce an abnormal noise, etc. All these and other faults should be detected and repaired.

In case the motor does not start it may have different faults (see the table):

Possible causes of faults	**Ways of repair**
1. Fuses are faulty.	1. Replace the fuses.
2. Motor is overloaded.	2. Reduce motor load.
3. Circuit in armature winding has an open.	3. Repair the armature winding.
In case the motor, when started, stops:	
1. Rheostat is shorted.	1. Check the rheostat and repair it.
2. Rheostat switches from one position to another.	2. Slow down operation of rheostat handle.
Brushes may spark in case:	
1. Motor is overloaded.	1. Reduce the load and remove overload.
2. Brushes are in poor condition.	2. Replace the brushes.
3. Pressure is low.	3. Adjust the pressure.
4. Pressure is excessive.	4. Adjust the pressure.
In case the armature winding is overheated:	
1. Motor is overloaded.	1. Remove the overload.
2. Ventilation fails to operate properly.	2. Check for slowing down the speed of the motor.
In case of abnormal motor speed:	

1. Motor is overloaded.	1. Reduce the load.
2. Rotor circuit has poor contact.	2. Repair the shorting mechanism.
In case rotor brushes against stator:	
Rotor brushes against stator.	Adjust air gap.

Circuit components	**Symbols**
Electric energy source	
D.c. generator	
D.c. motor	
Chemical power source (primary or storage cell)	
Electric lamp	
Electric connection, removable and permanent	
Switches, single- and double-pole switches	
Fuse	
Load, resistor	
Safety earthing system	
Rheostat, or variable resistor	
Transformer, air-core T,	
iron-core T	
Capacitor, fixed C, variable C	

Complete the sentences using the correct variant:

1. A motor with a fault a) operates normally.
   b) operates poorly.
2. Motor brushes spark in case a) they are in normal conditions.
   b) they are in poor conditions.
3. Burnt commutator should be a) replaced.
   b) repaired.
4. Brushes may spark in case a) pressure is low.
   b) pressure is excessive.
5. Air gap is adjusted in case a) the rotor brushes against the stator.

b) the stator brushes against the rotor.

8. Answer these questions:

1. When does a motor operate poorly?
2. What should be done in case the motor is overloaded?
3. What should be done in case the fuses are faulty?
4. What should be done in case the rheostat is shorted?
5. What should be done in case the brushes spark?
6. What should be done in case the pressure is low?
7. What should be done in case the ventilation does not operate?
8. What should be done in case the rotor brushes against stator?

9. Say a few words about your electrical engineering laboratory. Are there any faulty devices in it? Have a talk with your groupmate about the faults and the ways to repair them.

10. You know that all electrical devices and installations are constructed of a certain number of components. To these components belong electric power11. Draw schemes of circuits and devices constructed from these components. Have a talk with your groupmates about them:

1. Connect four resistors, two voltage sources and a switch in series. Speak about the construction and the operation of the circuit.
2. Connect several resistors and cells in series-parallel. Suppose that one of the resistors gets open; what does it result in? Suppose that a whole set gets open. What does it result in?
3. Measure the value of current (voltage, power, resistance) in the circuit. Use proper meters. Speak about the way you connect the meters to the circuit.
4. Take the proper components and construct an earthing protection system. Draw its scheme. Speak about its operation.
4. Draw a scheme of a thermal relay. What components are necessary for it?
5. Draw a scheme of an overhead transmission line. Speak about its operation. What are its possible faults?

.Draw a scheme of a substation. Speak about its operation and about its possible faults. What are the ways of their repair?

Electric Power Consumers and Power Systems

1. a) Cover the right column and read the English words. Translate them into Russian and check your translation.

b) Cover the left column and translate the Russian words back into

toachieveдостигать
toBelong (to) принадлежать, относится (к)
to feed снабжать, питать
to determine определять
torelate относится (к), быть связанным (с)
predominant преобразовывающий
graph кривая, график
nationaleconomy народное хозяйство

2. Read the words and put down their Russian equivalents. Then translate them back into English (orally).
   Characteristic -
   Municipal -
   to electrify -
   hydro -
   period–
3. Distribute the words below into three columns:

Actionprocess doer

utilizer, protect, distribution, utilize, protection, distributor, consumption, consume, utilization, consumer

4. Put down the Russian equivalents of these word combinations. Translate them back into English (orally).

a. load graph _____
lighting load
power load

b. power utilizing devices
parallelly operating plants
enterprises utilizing power

5. Complete the sentences translating the words in brackets:

1.Water-turbine (заводы) are called hydroturbines.

2.Load graph (определяет) the operating load (условия).

3.Economical(потребление) of electric power (достигается) by interconnected operation of power plants.

Electric Power Consumers and Power Systems

An electric power consumer is an enterprise utilizing electric power. Its operating characteristics vary during the hours of day, days and nights, days of week and seasons.

All electric power consumers are divided into groups with common load characteristics. To the first group belong municipal consumers with a predominant lighting load: dwelling houses, hospitals, theatres, street lighting systems, mines, etc.

To the second group belong industrial consumers with a predominant power load (electric motors): industrial plants, mines, etc.

To the third group belongs transport, for example, electrified railways. The fourth consists of agricultural consumers, for example, elec- trotractors.

„The operating load conditions of each group are determined by the load graph. The load graph shows the consumption of power during different periods of day, month, and year. On the load graph the time of the maximum loads and minimum loads is given.

Large industrial areas with cities are supplied from electric networks fed by electric power plants. These plants are interconnected for operation in parallel and located in different parts of the given area. They may include some large thermal and hydroelectric power plants.

The sum total of the electric power plants, the networks that interconnect them and the power utilizing devices of the consumers, is called a power system. All the components of a power system are interrelated by the common processes of protection, distribution, and consumption of both electric and heat power.

In a power system, all the parallelly operating plants carry the total load of all the consumers supplied by the given system.

The building up of a power system is of great importance for the national economy. An economical utilization of the power plant installations and of the sources of power is achieved by interconnected operation of a series of power plants in a common power distribution system.

3. Answer these questions:

1. What enterprises are called electric power consumers?
2. When do their operating characteristics vary?
3. What consumers belong to the four different groups?
4. What conditions does the load graph determine?
5. What type of system is called a power system?
6. What processes interconnect the components of a power system?
7. In what way is an economical utilization of power installations achieved?

7. Describe a power system and its operation.

Substations

1.a) Cover the right column and read the English words. Translate them into Russian and check your translation.

b) Cover the left column and translate the Russian words back intoEnglish.

Auxiliary - вспомогательный, добавочный

Breaker - выключатель, прерыватель

Busbar-собирательнаяшина

Feeder-фидер

Flexible-гибкий

Tocomprise-включатьвсебя

Todistribute-распределять

As … to-чтокасается

Aswellas-так же, как и

2. Put down the Russian equivalents of these word combinations. Translate them back into English (orally).

circuit breaker

auxiliary units

distributioncentre

flexible construction

reliable operation

switch gear bus

hydraulic as well as solar sources of energy

as to phase-word motors

3. Fill in as well as, as to and translate the sentences:

1. Excessive starting current may result in fluctuations in the voltage ... in other faults of the motor.

2. ... A.C. motors they are subdivided into single- and three-phase motors.

Substations

A substation is designed to receive energy from a power system, convert it and distribute it to the feeders. Thus a substation serves as a distribution centre. Substations feed (supply) various consumers provided that their basic load characteristics are similar. Therefore the energy is distributed without transformation of the voltage supplied.

Common substations comprise isolators, switchgear buses, oil circuit breakers, fuses, power and instrument transformers and reactors.

Substations are classed into step up and step down ones. The step up substation includes transformers that increase the voltage. Connected to the busbars of the substation are the power transmission lines of power plants of the system.

As to step down substations, they reduce the voltage to 10 or 6 kV. At this voltage the power is supplied to the distribution centres and to the transformer substations of power consumers.

A transformer substation serves for transmitting and distributing electric power. It comprises a storage battery, control devices and auxiliary structures.

Transformer substations are classed into indoor and outdoor; both types are used for feeding industrial enterprises. Compared to other types of substations, transformer substations have certain advantages.

They have flexible construction and easy and reliable operation. In case of a fault in the left-hand section, the main circuit breaker opens while the normally open section circuit breaker closes and puts the voltage of the section to normal. Power from a substation is delivered to distribution centres.

4. Complete the sentences using the correct variant:

1.A substation serves

a) to consume energy.

b) to distribute energy.

c) to convert energy.

2.A substationfeedsconsumers

a)with various load characteristics.

b) with similar load characteristics.

3. The lines of power plants are connected

a) to the busbars.

b) to the switchgear.

4. A substation comprises

a) the main elements.

b) the main and auxiliary elements.

5.Flexibleconstructionis

a) an advantage.

b) a disadvantage.

5.Pair work. Put these questions to your groupmate, and ask him/her to answer them.

1.What does a substation serve for?

2. What type of consumers does a substation feed?

3. What parts are the power transmission lines connected to?

4. What components does a substation comprise?

5 . What types are substations classed into?

6. What are advantages of a transformer substation

Hydroelectric Power Plants

1. a) Cover the right column and read the English words. Translate them into Russianand check your translation.

b) Cover the left column and translate the Russian words back into English

blade	-	лопасть
level	-	уровень
magnitude	-	величина
head	-	(зд.) верх, верхушка
plant	-	станция, завод
runner	-	ротор
shaft	-	привод, вал
torotate	-	вращать(ся)
to influence	-	влиять
to fluctuate	-	колебаться

2. Put down the Russian equivalents of these word combinations.Then translate them back into English (orally).

runner blade -
turbine runner -
turbine shaft -
water level -
water head -
large capacity power plant -
magnitude of the water head -
daily inflow of water -
turbine runner shaft -

Hydroelectric Power Plants

Hydroelectric power plants are built on rivers. Large-capacity; hydroelectric power plants are commonly located at considerable distances from the consumers of electric power.

The production process at these plants is rather simple: the water flows into the hydroturbine runner, acts upon the runner blades-and rotates the runner and the turbine shaft.

The generator shaft is connected to the turbine runner shaft. The difference in the water level influences the power capacity of a plant, i.e. the magnitude of the water head and the daily inflow of water fluctuates considerably according to the season.

The production process is different at power plants of different constructions and of different kinds. In atomic power plants, for example, it is not so simple as in hydroelectric plants.

3. Complete the sentences using the correct variant:

1.Hydroelectricpower plantsare built.

a) on rivers.

b) onwaterfalls

2.Large-capacity power plantsare located.

a) at a short distance from consumers of power.

b) at a considerable distance from consumers of power.

3.The production process at theplants

a) is very complex.

b) is rather simple.

4. The power capacity of aplant

a) remains constant.

b) changes considerably.

c) is influenced by the difference in the water level.

5.The daily inflow of water

a) fluctuates according to the consumption.

b) fluctuates according to the season.

6.The production process

a) depends upon the construction of the plant.
b) is the same at power plants of different constructions.

4. Pair work. Put these questions to your groupmate and ask him/her to answer them:

1. On what sites are hydroelectric power plants built?
2. Are large-capacity plants located far from consumers of power?
3. Is the production process at the plants simple or is it complex?
4. What influences the power capacity of a plant?
5. According to what factors does the daily inflow of water fluctuate?
6. Does the production process at the plant depend on its construction?
7. Do you know that a thermal power plant seldom has an efficiency more than 40%?

Full-wave Rectifier

1. a) Cover the right column and read the English words . Translate them into Russian and check your translation .

   b) Cover the left column and translate the Russian words back into English.

end	конец , конечный
tap	отвод , ответвление
filament	нить накала
lower	нижний
upper	верхний
secondary	вторичный
end capacity	конечная ёмкость
end coils	концевые витки
filament battery	батарея накала
filament current	ток накала
secondary circuit	вторичный контур
secondary resistance	дополнительное сопротивление
secondary battery	аккумуляторная батарея
frequency waves	длинные волны

2. Read the words and put down their Russian equivalents . Translate them back into English (orally).

component

centre

maximum

minimum

sum

3. Put down the Russian for :

   Centre tap

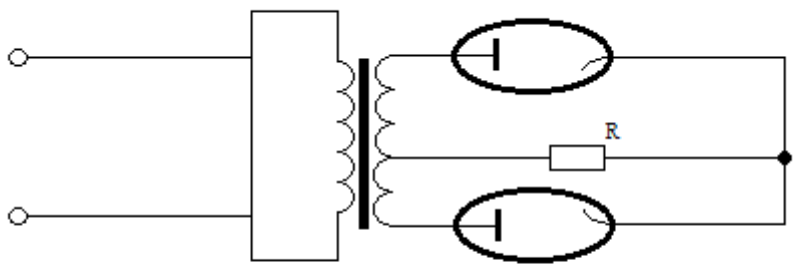
   Low voltage winding

   Tube plate

   Filament winding

Full-wave Rectifier

In a full-wave two diodes are used . They are connected to a common load resistance . The secondary of the transformers has a centre tap to which the load is connected . Current flows through the tubes from their plates cathodes .When the upper and of the high-voltage winding is positive , current flows through the upper tube .
During the opposite half cycle the lower end of the high voltage winding becomes positive . The plate of the lower tube becomes positive and the plate of the upper tube –negative . Thus now the lower tube conducts current . Current flows through the filament winding to its centre tap , then through the load to the center tap of the high-voltage winding and to the tube plate which is positive .



4. Complete the sentences using the correct variant :

1 A full-wave rectifier contains a) one diode .

b) two diodes .

2 . The load is connected to a) the centre tap to the primary.

b) the centre tap to the secondary .

3. Current flows through the tubes a) from the plates to the cathodes .

b) from the cathodes to the plates .

4. When the upper end of the high-voltage winding is positive

a) current flows through the upper tube .

b) current flows through the lower tube.

5. During the negative half-cycle a) the plate of the lower tube becomes positive .

b) the plate of the lower tube becomes negative .

6. During the positive half-cycle a) the lower tube conducts current .

b) the upper tube conducts current .

5. Complete the sentences using *while* . Follow the model on page 13 .

1. A half-wave rectifier contains one diode ……..

2. When the upper and of the high-voltage winding is positive , current flows through the upper tube ……..

3 During the negative half-cycle the lower tube conducts current …….

5. Pair work . Put these questions to your groupmate and let him/her answer them.

1 . How many diodes does a full-wave rectifier contain ?

2 . What element is the load connected to ?

3. What is the direction of current in the tubes ?
4. During which cycle does the plate become negative ?
5. When does the lower tube conduct current ?
6. When does the upper tube conduct current ?
7. What is the difference between a half-wave and a full-wave rectifier?
8. What is the difference in their construction ?
9. In what way does a full-wave rectifier operate ?
10. In what way does a half -wave rectifier operate?
11. What are the main parts of a half-wave rectifier ?
12. What are the main parts of a full-wave rectifier?

Use of Electron Tube .

1.a) Cover the right column and read the English words. Translate them into Russian and check your translation .

b) Cover the left column and translate the Russian words back into English.

half	половина
to rectify	выпрямлять
to amplify	усиливать
to convert	преобразовывать , обращать
by means of	посредством , с помощью
that is why	вот почему
to put into operation	приводить в действие , запускать

2. Read the words and put down their Russian equivalents:

pulse	electron
cycle	radio

3. Distribute the words below into the three columns :

Action	process	doer

use, rectifier , rectification , amplifier , amplify , convert , user , converter , application , apply , pulse , pulsation , operate , operator .

4. Translate these word combinations into Russian :

a . half-wave

half-cycle

half-wave rectifier

positive half-cycle

electron tube application

negative half-cycle

by means of a filter

b. by means of the suppressor grid

tube used as rectifiers

tube used as oscillators

Let us consider some cases of electron tube application . Tube are common elements of radio and electron devices . Tube are used

as rectifiers -to convert a.c. into d.c..,

as oscillators –to produce oscillating waves and

as amplifiers – to amplify the voltage and current .

Half-Wave Rectifier

Alternating current is converted into direct currant by means of a rectifier .

A half-wave rectifier consists of a diode in series with a resistance . In order to put a rectifier into operation , a source of a.c. should be applied to it . When an a.c. source is applied the diode begins to conduct . The rectifier passes current during positive half-cycles of the applied voltage . That is why it is called a half-wave rectifier. It is a pulsating current . Since pulsating should be eliminated , a filter is applied . Pulsations are eliminated by means of this filter .

5. Complete the sentences using the correct variant :

1. Electron tubes are used a) as amplifiers only .

   B) as oscillators only .

   c) as rectifiers , amplifiers and oscillators .

2. A.c. is converted into d.c. a) by means of a rectifier

   b) by means of an amplifier .

3. A half-wave rectifier consists of a) a diode in series with a transformer .

   b) a diode in series with a resistor .

4. In order to put a rectifier into operation a) d.c. is applied.

   b) a.c. is applied .

5. A half-wave rectifier passes current a) during positive half-cycles of the applied voltage .

   b) during positive and negative half-cycles.

6. Rectified current is a) direct oscillating current .

   B) direct pulsating current.

7. Pulsations are eliminated a) by means of a choke coil .

b) by means of a filter .

6. Answer the following questions :

1 How are electron tubes used ?

2 What type of device is called a rectifier?

3 By what means is alternating current rectified into direct current ?

4 What elements does a half-wave rectifier consist of ?

5 What current should be applied to put a half-wave rectifier into operation ?

6 When does a half-wave rectifier pass current ?

7 By what means are pulsations eliminated ?

Electric Motors

1. a) Cover the right column and read the English words. Translate them into Russian and check your translation.

b) Cover the left column and translate the Russian words back into English.

condition	условие
plant	завод
pole	полюс
	вращение, момент вращения
	бедный, плохой (заводская) табличка

2. Read the words and put down their Russian equivalents. Then translate them back into English.

['indastri] industry _____
I'saivis] service _____
[4raenspD:t] transport _____
I'mouta] motor _____
['praektikal] practical_____
[pou'tenjal] potential _____

3. Give the Russian for:

magnet pole_____

different conduit _____ —

machine ratings _____ . _____ ---

rated torque

service life_____ ---

poor operation_____ . _____ .----------

4. Form adjectives and adverbs. Translate them into Russian.

a. care - careful _____ . --------

use -_____ ---------

power - _____ ------

b.care - careless_____ ----------

use -_____ ----------

power - _____ ----------

wire -_____. ----------

c.normal - normally_____ ----------

practical - _____. _____ .—. ----------

potential - _____----------

abnormal -_____ ----------

poor -_____----------

5. Answer these questions:

5. What types of magnets are used in heavy industry?
6. How long is motors' service life under normal conditions?
7. Are motors used in every branch of industry?
8. What are the main types of motors in use nowadays?

Electric Motors

Motors are used for converting different forms of energy into mechanical energy.

The main part of a motor is a coil or armature. The armature is placed between the poles of a powerful magnet. When a motor is put

into operation current starts flowing through the coil (armature) and the armature starts rotating.

Electric motors are used practically in every branch of industry, transport, and agriculture. Naturally, they are produced in many different designs. They are used in industrial plants, and operate under different conditions.

Each motor is supplied with a nameplate which bears machine ratings: output power, voltage, the rated current, the starting current, the power factor, the efficiency, and the rated torque.

These motor ratings should be taken into consideration since they are necessary for the users. On them depends the length of motors' service life, which is normally equal to about 10 years, provided that the operating conditions are normal. Naturally, under abnormal conditions the service life becomes much shorter: motors operate poorly and may have different faults.

6. Complete the sentences using the correct variant:

1. Motors are used a) for transmitting energy.
   b) for converting energy.
2. Motor's main part is a) the frame.
   d)the armature.
   e)the stator.
3. The armature is placed a) between the poles of the magnet.
   b) about the poles of the magnet.
6. Motors' service life becomes a) under normal conditions, shorter b) under abnormal conditions.
7. Faulty motors operate a) normally.
   b) poorly.

7. Answer these questions. Use them in a talk with your groupmate:

9. What are motors used for?
10. What is the motor's main part?
11. Where is the armature placed?
12. What ratings does the nameplate of a motor bear?
13. Under what conditions does a motor operate normally (poorly)?

8. Read about energy resources of today. Write three questions about the text and ask your groupmate to answer them.

Energy Resources of Today

People are energy-rich today. Solar energy is considered to be a potentially limitless source of clean energy. The waters of the world contain potential fuel - in the form of a special isotope of hydrogen - deuterium. It is sufficient to power fusion reactors for thousands of years.

1. a) Cover the right column and read the English words. Translate them into Russian and check your translation.

b) Cover the left column and translate the Russian words back into English.

To repair- ремонтировать
Brush- щетка
Gap- зазор, люфт
repair
slow (adj)
Spark- искра
Speed- скорость
Noise- шум
Slow- медленный
Excessive- избыточный
Check- проверка
to adjust- регулировать, подгонять

Read the words and put down their Russian equivalents:

['komju:teit9] commutator _____
['steita) stator_____
['routa] rotor ['kontaekt]
ntact [kan'taekt] [prouses]
to

3. Put down the verbs corresponding to the given nouns and translate them:

eck check
spar

4. Put down the Russian equivalents of these word combinations. Translate them back into English (orally).

air gap
brush sparks _____

slow speed excessive speed

safety devices _____

14.Answer these questions

15.What do motors' faults result from?

16.Are there any faults that can be ignored?

4. What makes motors' service life shorter?

5. What does voltage supply stop result in?

6. What processes show the (dis)advantages of devices?

6. Are the words: spark, short, slow, brush, fault, load, test nouns? Are they verbs? Translate the sentences into Russian:

10.New motors are given a no-load and under a load tests.

11.When the motor is tested it should produce no abnormal noise.

12.In case this noise appears the motor must be disconnected.

13.This generator must be checked; one should give it a test.

14.The motor's brushes seem to be sparking. Can you see the sparks?

15.The windings of the coil are shorted. I have detected a short in the windings.

16.The armature rotates slowly; let's check it up!

17.The speed of rotation is too excessive; it must be slowed down.

18.In case the rotor brushes against the stator, the motor operates slowly. The faulty brushes should be replaced.

Faults of Motors and Ways of Their Repair

Motors may have different faults. A faulty motor does not start, or, when it is started, it operates at an excessive speed.

Its brushes may spark and its windings and the commutator may be overheated and burnt. Besides, a motor may produce an abnormal noise, etc. All these and other faults should be detected and repaired.

In case the motor does not start it may have different faults (see the table):

Possible causes of faults	Ways of repair
1. Fuses are faulty.	1. Replace the fuses.
2. Motor is overloaded.	2. Reduce motor load.
3. Circuit in armature winding has an open.	3. Repair the armature winding.
In case the motor, when started, stops:	
1. Rheostat is shorted.	1. Check the rheostat and repair it.

2. Rheostat switches from one position to another.	2. Slow down operation of rheostat handle.
Brushes may spark in case:	
1. Motor is overloaded.	1. Reduce the load and remove overload.
2. Brushes are in poor condition.	2. Replace the brushes.
3. Pressure is low.	3. Adjust the pressure.
4. Pressure is excessive.	4. Adjust the pressure.
In case the armature winding is overheated:	
1. Motor is overloaded.	1. Remove the overload.
2. Ventilation fails to operate properly.	2. Check for slowing down the speed of the motor.
In case of abnormal motor speed:	
1. Motor is overloaded.	1. Reduce the load.
2. Rotor circuit has poor contact.	2. Repair the shorting mechanism.
In case rotor brushes against stator:	
Rotor brushes against stator.	Adjust air gap.

Circuit components	Symbols
Electric energy source	
D.c. generator	
D.c. motor	
Chemical power source (primary or storage cell)	
Electric lamp	
Electric connection, removable and permanent	
Switches, single- and double-pole switches	
Fuse	

Load, resistor	
Safety earthing system	
Rheostat, or variable resistor	
Transformer, air-core T,	
iron-core T	
Capacitor, fixed C, variable C	

Complete the sentences using the correct variant:

1. A motor with a fault a) operates normally.
   b) operates poorly.
2. Motor brushes spark in case a) they are in normal conditions.
   b) they are in poor conditions.
3. Burnt commutator should be a) replaced.
   b) repaired.
4. Brushes may spark in case a) pressure is low.
   b) pressure is excessive.
5. Air gap is adjusted in case a) the rotor brushes against the stator.
   b) the stator brushes against the rotor.

8. Answer these questions:

9. When does a motor operate poorly?
10. What should be done in case the motor is overloaded?
11. What should be done in case the fuses are faulty?
12. What should be done in case the rheostat is shorted?
13. What should be done in case the brushes spark?
14. What should be done in case the pressure is low?
15. What should be done in case the ventilation does not operate?
16. What should be done in case the rotor brushes against stator?

9. Say a few words about your electrical engineering laboratory. Are there any faulty devices in it? Have a talk with your groupmate about the faults and the ways to repair them.

10. You know that all electrical devices and installations are constructed of a certain number of components. To these components belong electric power11. Draw schemes of circuits and devices constructed from these components. Have a talk with your groupmates about them:

Connect four resistors, two voltage sources and a switch in series. Speak about the construction and the operation of the circuit.
Connect several resistors and cells in series-parallel. Suppose that one of the resistors gets open; what does it result in? Suppose that a whole set gets open. What does it result in?
Measure the value of current (voltage, power, resistance) in the circuit. Use proper meters. Speak about the way you connect the meters to the circuit.
Take the proper components and construct an earthing protection system. Draw its scheme. Speak about its operation.
Draw a scheme of a thermal relay. What components are necessary for it?
Draw a scheme of an overhead transmission line. Speak about its operation. What are its possible faults?
.Draw a scheme of a substation. Speak about its operation and about its possible faults. What are the ways of their repair?

Electric Power Consumers and Power Systems

5. a) Cover the right column and read the English words. Translate them into Russian and check your translation.

   b) Cover the left column and translate the Russian words back into

to achieve	достигать
to Belong (to)	принадлежать, относится (к)
to feed	снабжать, питать
to determine	определять
to relate	относится (к), быть связанным (с)
predominant	преобразовывающий
graph	кривая, график
nationaleconomy	народное хозяйство

6. Read the words and put down their Russian equivalents. Then translate them back into English (orally).
   Characteristic -
   Municipal -
   to electrify -
   hydro -
   period–
7. Distribute the words below into three columns:

Actionprocess doer

utilizer, protect, distribution, utilize, protection, distributor, consumption, consume, utilization, consumer

8. Put down the Russian equivalents of these word combinations. Translate them back into English (orally).

a. load graph _____
lighting load
power load

b. power utilizing devices
parallelly operating plants
enterprises utilizing power

5. Complete the sentences translating the words in brackets:

1.Water-turbine (заводы) are called hydroturbines.

2.Load graph (определяет) the operating load (условия).

3.Economical(потребление) of electric power (достигается) by interconnected operation of power plants.

Electric Power Consumers and Power Systems

An electric power consumer is an enterprise utilizing electric power. Its operating characteristics vary during the hours of day, days and nights, days of week and seasons.

All electric power consumers are divided into groups with common load characteristics. To the first group belong municipal consumers with a predominant lighting load: dwelling houses, hospitals, theatres, street lighting systems, mines, etc.

To the second group belong industrial consumers with a predominant power load (electric motors): industrial plants, mines, etc.

To the third group belongs transport, for example, electrified railways. The fourth consists of agricultural consumers, for example, elec- trotractors.

„The operating load conditions of each group are determined by the load graph. The load graph shows the consumption of power during different periods of day, month, and year. On the load graph the time of the maximum loads and minimum loads is given.

Large industrial areas with cities are supplied from electric networks fed by electric power plants. These plants are interconnected for operation in parallel and

located in different parts of the given area. They may include some large thermal and hydroelectric power plants.

The sum total of the electric power plants, the networks that interconnect them and the power utilizing devices of the consumers, is called a power system. All the components of a power system are interrelated by the common processes of protection, distribution, and consumption of both electric and heat power.

In a power system, all the parallelly operating plants carry the total load of all the consumers supplied by the given system.

The building up of a power system is of great importance for the national economy. An economical utilization of the power plant installations and of the sources of power is achieved by interconnected operation of a series of power plants in a common power distribution system.

4. Answer these questions:

1.What enterprises are called electric power consumers?
2.When do their operating characteristics vary?
3.What consumers belong to the four different groups?
4.What conditions does the load graph determine?
5.What type of system is called a power system?
6. What processes interconnect the components of a power system?
7. In what way is an economical utilization of power installations achieved?

7. Describe a power system and its operation.

Substations

1.a) Cover the right column and read the English words. Translate them into Russian and check your translation.

b) Cover the left column and translate the Russian words back intoEnglish.

Auxiliary - вспомогательный, добавочный

Breaker - выключатель, прерыватель

Busbar-собирательнаяшина

Feeder-фидер

Flexible-гибкий

Tocomprise-включатьвсебя

Todistribute-распределять

As … to-чтокасается

Aswellas-так же, как и

2. Put down the Russian equivalents of these word combinations. Translate them back into English (orally).

circuit breaker

auxiliary units

distributioncentre

flexible construction

reliable operation

switch gear bus

hydraulic as well as solar sources of energy

as to phase-word motors

3. Fill in as well as, as to and translate the sentences:

1. Excessive starting current may result in fluctuations in the voltage ... in other faults of the motor.

2. ... A.C. motors they are subdivided into single- and three-phase motors.

Substations

A substation is designed to receive energy from a power system, convert it and distribute it to the feeders. Thus a substation serves as a distribution centre. Substations feed (supply) various consumers provided that their basic load characteristics are similar. Therefore the energy is distributed without transformation of the voltage supplied.

Common substations comprise isolators, switchgear buses, oil circuit breakers, fuses, power and instrument transformers and reactors.

Substations are classed into step up and step down ones. The step up substation includes transformers that increase the voltage. Connected to the busbars of the substation are the power transmission lines of power plants of the system.

As to step down substations, they reduce the voltage to 10 or 6 kV. At this voltage the power is supplied to the distribution centres and to the transformer substations of power consumers.

A transformer substation serves for transmitting and distributing electric power. It comprises a storage battery, control devices and auxiliary structures.

Transformer substations are classed into indoor and outdoor; both types are used for feeding industrial enterprises. Compared to other types of substations, transformer substations have certain advantages.

They have flexible construction and easy and reliable operation. In case of a fault in the left-hand section, the main circuit breaker opens while the normally open section circuit breaker closes and puts the voltage of the section to normal. Power from a substation is delivered to distribution centres.

4. Complete the sentences using the correct variant:

1.A substation serves
a) to consume energy.
b) to distribute energy.
c) to convert energy.

2.A substationfeedsconsumers
a)with various load characteristics.
b) with similar load characteristics.

3. The lines of power plants are connected
a) to the busbars.
b) to the switchgear.

4. A substation comprises
a) the main elements.
b) the main and auxiliary elements.

5.Flexibleconstructionis
a) an advantage.
b) a disadvantage.

5.Pair work. Put these questions to your groupmate, and ask him/her to answer them.

1.What does a substation serve for?
2. What type of consumers does a substation feed?
3. What parts are the power transmission lines connected to?
4. What components does a substation comprise?
5 . What types are substations classed into?
6. What are advantages of a transformer substation?

Hydroelectric Power Plants

3. a) Cover the right column and read the English words. Translate them into Russianand check your translation.

b) Cover the left column and translate the Russian words back into English

blade	-	лопасть
level	-	уровень
magnitude	-	величина
head	-	(зд.) верх, верхушка
plant	-	станция, завод
runner	-	ротор
shaft	-	привод, вал
torotate	-	вращать(ся)
to influence	-	влиять
to fluctuate	-	колебаться

4. Put down the Russian equivalents of these word combinations.Then translate them back into English (orally).

runner blade	-
turbine runner	-
turbine shaft	-
water level	-
water head	-
large capacity power plant	-
magnitude of the water head	-
daily inflow of water	-
turbine runner shaft	-

Hydroelectric Power Plants

Hydroelectric power plants are built on rivers. Large-capacity; hydroelectric power plants are commonly located at considerable distances from the consumers of electric power.

The production process at these plants is rather simple: the water flows into the hydroturbine runner, acts upon the runner blades-and rotates the runner and the turbine shaft.

The generator shaft is connected to the turbine runner shaft. The difference in the water level influences the power capacity of a plant, i.e. the magnitude of the water head and the daily inflow of water fluctuates considerably according to the season.

The production process is different at power plants of different constructions and of different kinds. In atomic power plants, for example, it is not so simple as in hydroelectric plants.

3. Complete the sentences using the correct variant:

1.Hydroelectricpower plantsare built.

a) on rivers.

b) onwaterfalls

2.Large-capacity power plantsare located.

a) at a short distance from consumers of power.

b) at a considerable distance from consumers of power.

3.The production process at theplants

a) is very complex.

b) is rather simple.

4. The power capacity of aplant

a) remains constant.

b) changes considerably.

c) is influenced by the difference in the water level.

5.The daily inflow of water

a) fluctuates according to the consumption.

b) fluctuates according to the season.

6.The production process

a) depends upon the construction of the plant.

b) is the same at power plants of different constructions.

5. Pair work. Put these questions to your groupmate and ask him/her to answer them:

8. On what sites are hydroelectric power plants built?
9. Are large-capacity plants located far from consumers of power?
10. Is the production process at the plants simple or is it complex?
11. What influences the power capacity of a plant?
12. According to what factors does the daily inflow of water fluctuate?
13. Does the production process at the plant depend on its construction?
14. Do you know that a thermal power plant seldom has an efficiency more than 40%?