ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ОБРАЗОВАНИЮ

ГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ
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РАЗВИТИЕ НАВЫКОВ УСТНОЙ РЕЧИ ПО СПЕЦИАЛЬНОСТИ «РАДИОТЕХНИКА»

(английский язык)

Методические указания
к лабораторным работам

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Данные методические указания состоят из 13 лабораторных работ, которые имеют цель способствовать развитию техники чтения, устных разговорных навыков. Выполнение лабораторной работы является составной частью подготовки студентов. Вся система упражнений направлена на усвоение специальной терминологической лексики, отличается разнообразными типами упражнений. Организация материала внутри каждой работы предусматривает формирование речевых умений от первичных навыков употребления лексических единиц по данной теме до упражнений, подготавливающих студентов к диалогической или монологической речи.

Предназначены для студентов 1 и 2 курсов факультета «Радиотехника» дневной формы обучения. Подготовлены на кафедре иностранных языков.

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Рецензент Н. Г. С т е п н о в а

Лабораторная работа 1

Samara State Aerospace University

Задание 1. Прослушайте, повторите и запомните слова:

1. aerospace	- аэрокосмический
2. training	- обучение
3. related industries	- смежные отрасли промышленности
4. founder	- основатель
5. faculty	- факультет
6. aircraft	- самолет, авиация
7. engine	- двигатель
8. engineering	- техника
9. economics	- экономика
10. management	- управление
11. simultaneously	- одновременно
12. staff	- штат сотрудников
13. department	- кафедра
14. a yacht club	- яхт-клуб
15. a hostel	- общежитие
16. facility	- удобства
17. to be engaged	- быть вовлеченным в
18. applied	- прикладной
19. research and development	- исследование и развитие
20. specialization	- специализация
21. adherence to	- приверженность
22. provide for	- обеспечивать
23. bilingual	- двуязычный
24. management and marketing	- управление и маркетинг

Задание 2. Прочтите и догадайтесь о значении следующих слов и словосочетаний:
leading higher education institution; space-rocket construction industry; to be renamed; to include; a catering facility; distinctive feature; adherence to; education through research principle; to take part in; to develop cooperation with; cooperation agreements.

Задание 3. Прочтите и переведите текст.

Samara State Aerospace University

Samara State **Aerospace** University (SSAU) is a leading higher education institution for the **training** of engineers for the aviation, space-rocket construction and radio-electronics and other **related industries.** It was established in 1942 as the Kuibyshev Institute of Aviation. In 1966 it was renamed after S.P.Korolyov, the **founder** of cosmonautics, and in 1992 the institute became Samara State Aerospace University.

There are seven **faculties** at the University: Faculty of Aircraft Construction, Faculty of **Aircraft Engines,** Faculty of Aviation Transport Engineers, Faculty of Plastic Working of Metals, Faculty of **Radio-Engineering,** Faculty of Information Science, College **of Economics** and **Management.**

About 6000 students are **simultaneously** trained at the University, and its **staff** includes more that 7000 teachers. The University has 40 **departments,** laboratories, classrooms, computing centres, a well-stocked library, a sports club, a sports centre with a swimming-pool, a summer sports camp, a **yacht** club, a museum of aviation, a museum of aircraft engine history, a fitness and health centre, a catering **facility,** a print facility, seven student **hostels** and others.

The University is a large scientific centre **engaged in** theoretical and **applied research and development.** Now its seven faculties train students in 21 **specializations.** One distinctive feature of the University is **adherence to** the "education-through research" principle. Students have always taken an active part in research efforts. The University's strong scientific traditions and excellent facilities make it a leading institution for both state and regional scientific programmes. As a result of research and development carried out at the University a number of instruments, devices and systems have been developed, made, tested and commercially produced in small quantities.

In 1990 the University began to intensively develop cooperation with foreign partners. Cooperation agreements with foreign universities **provide for** training of **bilingual** specialists. The developments also help develop specialists in **management and marketing.**

The Aerospace University's foreign partners include Oxford Polytechnic (Great Britain), Munich Technical University (Germany), Bradley University and Dowling College (USA) and others.

Задание 4. Задайте к тексту письменно 3 специальных вопроса (1 вопрос к подлежащему), 2 общих вопроса, 1 альтернативный и 1 разделительный вопросы.

Задание 5. Дайте английские эквиваленты: ведущее высшее учебное заведение; предприятие; постоянно; специализация; готовить; одновременно; штат сотрудников; кафедра; общежитие; отличительная черта; верность чему-либо; предоставлять; управление; двуязычный.

Задание 6. Согласитесь или опровергните утверждение. Начинайте предложения с фраз: I'm afraid that's wrong; you are quite right/you are not quite right; that's not quite so; I think you are mistaken; as far as I know; I think so/I don't think so; according to the text.

1. SSAU is a leading higher education institution for the training of engineers for the aviation only.
2. It was established in 1942, wasn't it?
3. About 7000 students are simultaneously trained at the University.
4. The University is only a large educational center.
5. Students have always taken an active part in research efforts.
6. The University's seven faculties train students in 15 specializations.
7. The University doesn't have any foreign partners.

Задание 7. Не глядя в текст, дополните предложения.

1. SSAU is .....
2. .....In 1942.
3. In 1966.....
4. There are ..... at the University.
5. ..... .are simultaneously trained at the University.
6. The University is a large scientific centre .....
7. Students have always taken an active part .....
8. ..... for both state and regional scientific and technological programmes.
9. A number of instruments, devices and systems ..... .

Задание 8. Составьте из данных слов предложение: logical; the; was; establishment; the; needed; of; Institute; a; engineers; such; plants; the during; and; hard; needed; time; as; planes; front.

Задание 9. Расскажите по-английски тему "SSAU".

Задание 10. Письменно переведите текст.

How to Improve your English

Relax as you learn but learn as you relax. Even the playing of a game requires a certain amount of work. Learn carefully a definite period every day - two hours, an hour, even half an hour if that is all you can spare. But once you have decided upon the schedule, stick to it. Make your studying a daily habit and remember the old Roman adage: *"Make haste slowly"*. Don't try to learn too much at one sitting. Knowledge like a food, must be chewed and swallowed a little at a time.

The best way to learn a new subject is to stop from time to time to ask yourself how much material has become firmly fixed in your mind. Learn to read with your memory as well as with your own words.

Unlike your money, your knowledge increases as you share it.

Notes:

schedule – план
stick to – придерживаться
adage – пословица
haste – торопиться
chew – жевать

Контрольная работа 1.

I. Чтение.

Задание 1. Прочтите текст, поймите его содержание, вставьте вместо пропусков слова из рамочки.

facilities, provide, for, learning, computer, comfortable, range

The Oxford Polytechnic

Oxford is probably the greatest centre of ... 1.... in the world. It has been a place to study for seven hundred years.

The Oxford Polytechnic may only have existed ...2.... 20 years but its reputation throughout Britain and indeed throughout the world has become second to

none. Over 5000 students are studying the widest ...3.... of subjects here. What strikes you most is the extraordinary range of equipment and .. .4.... .

There are a quarter of a million books on the promises for you to read in the library or to take away. Another thing is the .. .5.... . It works 24 hours a day and 7 days a week. If you have a problem with speaking English there's a language laboratory to teach you quickly and sympathetically. There's a doctor to ...6.... advice and treatment free to all students. There are all sorts of sports available here.

The Polytechnic does everything it can to make your life ...7.... . So wherever you come from you'll be made to feel that the Polytechnic is home.

Задание 2. Вам даны ответы. Задайте к ним вопросы.

1. For seven hundred years.
2. Yes, it does. It works 24 hours a day and 7 days a week.

Задание 3. Расположите предложения в логической последовательности.

1. Oxford and Cambridge, the oldest universities are world-known for their academic excellence.
2. The academic year is split into three terms.
3. There are 46 universities in Britain.
4. After three years of study a university graduate will leave with the Degree of Bachelor of Arts or Science.
5. They differ from one another in history, tradition, academic organization.
6. Formal teaching takes place in the first terms which last for twenty four weeks in total.
7. A university usually consists of colleges.
8. Universities teach in all major subject areas: arts, science, law, engineering, medicine, social sciences.
9. The third term is reserved for classes and examinations and last for six weeks.
10. He can continue to take his Master's Degree and then the Doctor's.

II. Грамматика.

Задание 1. Задайте вопрос к подчеркнутому слову.

It takes me <u>25 minutes</u> to get to the office.

Задание 2. Найдите ошибку и исправьте ее.

A B C D

At the end of the day they <u>all are</u> hungry and <u>Jack's aunt</u> gives <u>a big meal</u> <u>them.</u>

Задание 3. Переведите на английский язык.

1. В моей библиотеке много прекрасных книг.
2. Посмотри в окно. Идет сильный дождь. Дождь идет уже 2 дня.
3. Мне жаль, но я не могу принять ваше предложение. У меня много работы.
4. Вы когда-нибудь пробовали (to taste/to try) японскую еду?
5. Когда я пришел в университет, то узнал, что профессор заболел.
6. Шел сильный снег, но мы надеялись, что скоро он прекратится.
7. Если вы немного подумаете, то дадите мне правильный ответ.
8. В этой ситуации есть что-то странное, не правда ли?

Лабораторная работа 2

S.P. Korolyov

Задание 1. Прослушайте, повторите и запомните слова:

1. designer - конструктор
2. artificial - искусственный
3. to launch - запускать
4. under the guidance - под руководством
5. acquaintance - знакомство
6. jet-propulsion - реактивное движение
7. participation - участие
8. to devote oneself to - посвятить себя чему-либо
9. to earn - зарабатывать, заслуживать
10. to award - награждать

Задание 2. Прочтите и догадайтесь о значении следующих слов:
System, sphere, cosmic, academician, aero-mechanical, group, hero, prize, bureau, enthusiast, experimental, talent, organizer, ideas, spirit, satellite, industry, title, order.
Задание 3. Прочтите и переведите текст.

Sergey Korolyov

Academician Sergey Korolyov was an outstanding Soviet scientist and **designer** of space-rocket systems. The first **artificial** Earth satellites and spaceships in which man made his first cosmic flights were made **under S.P.Korolyov's guidance.**

Korolyov was born on January, the 12th 1907, in the city of Zhitomir into the family of a teacher. From 1927 he worked in the Aircraft industry. In 1930, without leaving his job, he graduated from the aeromechanic department of the Moscow Bauman Higher Technical School and finished a flyer**'**s school the same year.

After **acquaintance** with Konstantin Tsiolkovsky and his ideas Korolyov became an enthusiast and one of the founders of space-rocketry engineering.

In 1933 the Group for Studying **jet propulsion** was organized with his **participation**, and they made the first experimental rockets. From then on he **devoted himself** entirely **to** developing Soviet space-rocketry engineering.

Korolyov reared many leading scientists and engineers who are now working in research and design bureaus in the sphere of space-rocketry engineering.

S.P.Korolyov was a talented research worker, a brilliant organizer and a man of high spiritual qualities. In 1967 our university was named after academician S.P.Korolyov.

Sergey Korolyov's fruitful work **earned** him the gratitude of the people and he received high government **awards**. He was twice awarded the title of Hero of Socialist Labour, and received the Lenin Prize, and Orders and Medals of the Soviet Union.

Задание 4. Дайте русские эквиваленты:
designer of space-rocket systems, artificial Earth satellites, aircraft industry, jet propulsion, space-rocketry engineering, design bureau, research worker, spiritual qualities, high government awards.

Задание 5. Найдите в тексте английские эквиваленты русских словосочетаний:
выдающийся советский ученый и конструктор, космические корабли, под руководством Королева, без отрыва от работы, летная школа, после знакомства с К.Э. Циолковским, основоположник ракетно-космической техники, полностью посвятил себя, талантливый исследователь.

Задание 6. Переведите производные:

to design - design - designer
to lead - leader - leading
to found - founder - foundation
to organize - organizer - organization
to acquaint - acquaintance
to participate - participant - participation
science - scientist - scientific

Задание 7. Подберите синонимы:

1. to design	1. to take part
2. to launch	2. to meet somebody
3. to participate	3. to construct
4. to devote oneself to	4. to start
5. to award	5. famous
6. artificial	6. to give oneself to
7. outstanding	7. man-made
8. to get acquainted with	8. to reward

Задание 8. Задайте вопросы к выделенным словам:
In 1933 the Group for Studying Jet Propulsion was organized with Korolyov's participation.

Задание 9. Согласитесь или опровергните утверждение. Начинайте предложения с фраз: I'm afraid that's wrong; you are quite right/ you are not quite right; that's not quite so; I think you are mistaken; as far as I know; I think so; according to the text.

1. The first artificial Earth satellites were made under Tsiolkovsky's guidance.
2. S.P.Korolyov graduated from the Engine Design Department of Samara State Aerospace University.
3. After acquaintance with Tsiolkovsky Korolyov became an enthusiast of space-rocketry engineering.
4. S.P.Korolyov devoted himself entirely to developing radio-engineering.
5. In 1992 our University was named after academician S.P.Korolyov.
6. S.P.Korolyov reared many leading scientists and engineers who are now working in the sphere of space-rocketry engineering.

Задание 10. Задайте к тексту 7 вопросов: общий, альтернативный, разделительный, специальный вопрос к подлежащему и 3 специальных вопроса к остальным членам предложения.

Задание 11. Расскажите по-английски тему "S.P.Korolyov".

Задание 12. Письменно переведите текст.

K.E. Tsiolkovsky

K.E.Tsiolkovsky , the founder of the modern theory of jet propulsion was born in 1857 in the little town of Izhevskoye in the Ryasan region. At the age of nine he fell seriously ill and became almost deaf. He could not go to school and continued to study at home, and books became his only teachers. At the age of 16 Tsiolkovsky was sent by his father to Moscow to study. He studied hard and three years later he came back home and earned his living by teaching mathematics at school.

K.E.Tsiolkovsky made a great contribution to the theory of rocket flight. In his paper "The Aeroplane or Bird-like Flying Machine",Tsiolkovsky suggested a design which is like the modern aeroplane. He foresaw that internal combustion engine would become the chief form of propulsive power for aircraft. It was Tsiolkovsky who proposed the idea of creating artificial satellites of the Earth, the principle of multistaged rocket.

Контрольная работа 2

I. Чтение.

Задание 1. Прочтите текст и поймите его содержание. Заполните пропуски словами из рамочки:

pioneer, researcher, science, designed, founder, devote, development, aircraft, aviation, investigated.

Since the early nineties Zhukovsky turned to ...1…. a new branch of engineering, which held out new horizons for the ...2…. . The Moscow University Laboratory of Applied Mechanics headed by Zhukovsky, began to ...3…. increasing attention to the subject. Models of ...4…. and aerodynamic instruments were ...5…. , built and tested, and various aerohydromechanical problems ...6…. .

In 1898, the X Congress of Naturalists and Physicians was held in Kiev. In a report to the Congress entitled "On Aeronautics" Zhukovsky outlined the future ...7…. of heavier-than-air craft.

The reports "On the Soaring of Birds" and "On Aeronautics" marked the begining of Zhukovsky's work as a ...8…. of aviation in Russia and a ...9…. of aeronautical ...10…. . From then on his interest in aviation clearly predominated over his other scientific interests.

Задание 2. Выберите номера предложений, которые соответствуют содержанию текста:

1. At the end of the 19th century the Laboratory of Applied Mechanics was headed by K.E.Tsiolkovsky.
2. Since the early nineties Zhukovsky devoted himself to aviation.
3. He designed, built and tested models of aircraft and aerodynamic instruments.
4. The report "On Aeronautics" was made by Zhukovsky at the X congress of Naturalists and Physicians in Kiev.

5. Well before the first aeroplanes Nikolai Zhukovsky turned to the construction of dirigible balloons.
6. Zhukovsky's interest in aviation predominated over his other scientific interests.

Задание 3. Вам даны ответы. Задайте к ним по 2 специальных вопроса.

1. At the end of the 19th century Zhukovsky was the most popular professor at the University and the leading figure in aeronautics.
2. This outstanding event in the history of aviation took place in Petersburg in 1913.

II Грамматика.

Задание 1. Употребите нужную форму сравнения:

1. Hydrogen was the (light) gas man knew.
2. Airplane can fly at (high) speed than helicopter.
3. This aeroplane can carry (many) passengers than that one.
4. The (powerful) the engine, the (great) distance the plane can cover.

Задание 2. Найдите ошибку и исправьте ее.

A

The airplane principle was regarded the <u>better</u> one because the airplane

B C

was <u>easier</u> and <u>less expensive</u> in comparison to dirigible.

Задание 3. Переведите предложения.

1. Чем мощнее двигатель, тем выше скорость летательного аппарата.
2. Его доклад на конференции был самым лучшим.
3. Характеристики этой силовой установки хуже.
4. Дальнейшее развитие авиации зависит от совершенствования двигателей.
5. Чтобы сделать эту работу, мне нужно больше данных.

Лабораторная работа 3

Russia

Задание 1. Прослушайте, повторите и запомните слова:

1. vast territory	- обширная территория
2. to lie	- лежать, находиться
3. to be washed by	- омываться
4. to border on	- граничить с
5. to vary from smth. to smth.	- изменяться от чего-либо до чего-либо
6. a desert	- пустыня
7. a valley	- долина
8. a mountain chain	- горная цепь
9. to be rich in	- быть богатым чем-либо
10. natural and mineral resources -	- природные ресурсы и полезные ископаемые

11. a deposit of smth. - месторождение чего-либо
12. the current population - население в настоящий момент
13. a parliamentary republic -парламентская республика
14. Head of State - глава государства
15. a branch - власть (как часть правительства)
16. legislative - законодательный
17. executive - исполнительный
18. judicial - судебный
19. to be exercised by - осуществляться (кем-либо, чем-либо)
20. the Federal Assembly - Федеральное собрание
21. a chamber - палата
22. the Council of Federation - Совет Федерации
23. the State Duma - Государственная дума
24. to be headed by - возглавляться кем-либо
25. to be elected by - избираться кем-либо
26. the Cabinet of Ministers - кабинет министров
27. a system of courts - система судов
28. the Constitutional Court - Конституционный суд
29. the Supreme Court - Верховный суд

Задание 2. Прочтите и переведите текст.

Russia

The **vast territory** of Russia **lies** in the eastern part of Europe and the northern part of Asia. Russia **is washed by** twelve seas and three oceans. The oceans are: the Arctic, the Atlantic, the Pacific. The seas are: the White Sea, The Black Sea, the Baltic Sea and others.

Russia **borders on** many countries, such .as Mongolia and China in the south-east, Finland and Norway in the north-west and so on.

The land of Russia **varies** very much **from** forests **to deserts**, from high mountains to deep **valleys**. The main **mountain chains** are the Urals, the Caucasus and the Altai. There are a lot of great rivers and deep lakes on its territory. The longest rivers are the Volga in Europe and the Ob, the Yenisei and the Lena in Asia. The largest lakes are Ladoga and Baikal.

The Russian Federation is **rich in natural and mineral resources**. It has **deposits of** gas, oil, coal, iron, gold and many others.

The **current population** of Russia is more than 150 million people.

Russia is a **parliamentary republic**. Head of the State in this country is the President. The government consists of three **branches: legislative**, **executive** and **judicial**. The **President** controls each of them.

The legislative power **is exercised by the Federal Assembly**. It consists of two **chambers: The Council of Federation** and **The State Duma.** Each chamber **is headed by the Speaker**. The members of the Federal Assembly **are elected by** the people for four years.

The executive power belongs to the Government, or **the Cabinet of Ministers**. The government is headed by the Prime Minister.

The judicial power belongs to the **system of courts.** It consists of **the Constitutional Court**, t**he Supreme Court** and other courts.

The national symbol of Russia is a white-blue-and-red banner.

Задание 3. Ответьте на вопросы:

1. Where does the vast territory of Russia lie?
2. What mineral resources are there in Russia?
3. What is the form of government in Russia and who is it headed by?
4. What is the national symbol of Russia?

Задание 4. *Подберите из "B" подходящие по смыслу слова к "A".*

A:	**B:**
1. presidential	a) assembly
2. vast	b) court
3. supreme	c) symbol
4. federal	d) chains
5. mountain	e) power
6. national	f) territory
7. legislative	g) republic

Задание 5. Переведите производные:

to vary – variety – various – variable – varied
nature – natural – naturally
to elect – election – elective – elector – electoral

Задание 6. Дайте английские эквиваленты: обширная территория; омываться чем-либо; граничить с; меняться; пустыня; долина; горная цепь; глубокие озера; быть богатым чем-то; минеральные ресурсы; месторождения; парламентская республика; состоять из; совет федерации; избираться; возглавляться кем-либо.

Задание 7. *Переведите на английский язык.*

- a). Байкал – самое большое и глубокое озеро в мире.
- b). На обширной территории России много лесов, высоких горных цепей, долин, рек и озер.
- c). Едва ли есть какая-нибудь другая страна в мире, которая так богата природными ресурсами и полезными ископаемыми.
- d). Президент является главой государства.
- e). Законопроект (a bill) должен быть одобрен (to approve) и подписан (to sign) президентом.

Задание 8. Письменно переведите текст, начиная со слов "The legislative power" и до конца.

Задание 9. Задайте вопросы.

1. Russia borders on many countries. (yes/ no question)
2. There are a lot of great rivers and deep lakes in Russia. (tail question)
3. The President controls each of them. (wh-question to the subject)
4. The members of the Federal Assembly are elected by people for four years. (2 wh-questions)

Задание 10. Расскажите по-английски тему “Russia”.

Задание 11. Прочтите текст. В первой части текста найдите ошибки (5) и исправьте их. Вторую часть текста переведите письменно. Слова после текста помогут вам перевести текст.

Moscow
(part 1)

Moscow is the capital of the Russian Federation, it administrative, economic, political and educational centre with the population of about 9 millions people. Its total area is about 900 thousand square kilometres.

The city was founded by Prince Yuri Dolgoruky and was first mentioned in the chronicles in 1147. At that time it was a small frontier settlement. By the 15th century Moscow has grown into a wealthy city.

In the 16 th century under Ivan the Terrible, Moscow became capital of the state of Moscovy. In the 18th century Peter the Great has transferred the capital to St.Petersburg, but Moscow remained the heart of Russian. That is why it became the main target of Napoleon’s attack in 1812. During the war of 1812 three quarters of the city were destroyed by fire, but by the middle of the 19th century Moscow was complete rebuilt.

The present-day Moscow is the seat of the government of the Russian Federation.

Moscow is a major industry city. Its leading industries are engineering, chemical and light industries.

(part 2)

Moscow attracts tourists from all over the world. It is known for its beautiful old cathedrals, churches and monasteries. Some of them date from the 15th to the 17th centuries. Moscow is also noted for its many historical buildings, for the famous Bolshoi, Maly and Art theatres as well as for its art museums. There are more than 80 museums in Moscow, and the most popular of them are the Tretyakov Gallery and the Pushkin Museum of Fine Arts. The Tretyakov Gallery houses a unique collection of Russian painters. Almost all famous Russian painters are represented there. The Pushkin Museum of Fine Arts contains a vast collection of antiquities and a well-known collection of modern foreign painters including Impressionists.

The oldest part of Moscow is the Kremlin. This the main tourist attraction in Moscow. In 1156 a small settlement of Moscow was surrounded by a wooden wall, and became a Kremlin. The word “Kremlin” means “fortress”, and it used to be a fortress until the 17th century. There are 20 towers in the Kremlin. The Spasskaya Tower is the symbol of Russia and Moscow. It has a famous clock which was installed in the middle of the 19th century.

Moscow is a city of science and learning. There are over 80 higher education institutions in the city, including a number of universities.

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total area	- общая площадь
to be first mentioned in the chronicles	- быть впервые упомянутым в летописях

frontier settlement	- пограничный поселок
to grow into a wealthy city	- превратиться в процветающий город
to transfer the capital to	- перенести столицу в
to become the main target	- стать главной целью
engineering	- машиностроение
chemical industry	- химическая промышленность
light industry	- легкая промышленность
to attract tourists	- привлекать туристов
to be known for	- быть известным чем-либо
a cathedral	- собор
a church	- церковь
a monastery	- монастырь
date from	- относиться к
to be noted for smth.	- быть известным чем-либо
an art museum	- художественный музей
to house	- вмещать
a unique collection of smth.	- уникальная коллекция чего-либо
to be represented	- быть представленным
to contain smth.	- содержать что-либо
a vast collection of smth	- большая коллекция чего-либо
antiquities	- древности
the main tourist attraction	- основной предмет интереса туристов
a fortress	- крепость
to be surrounded by	- быть окруженным
to cease to be a fortress	- перестать быть крепостью
to be installed	- быть установленным
science and learning	- наука и образование
a higher education institution	- высшее учебное заведение

Контрольная работа 3.

I. Чтение.

Задание 1. Прочтите текст, поймите его содержание, вставьте вместо пропусков слова из рамочки.

developed, confluence, frontiers, banks, including, mentioned, scientific

Samara

The Samara **region** lies along the **picturesque** …1…. of the Volga.

The city of Samara is the region's administrative center, **stretching** along the left bank from the …2…. of the Volga with the Samara river, from which the city takes its name. The population of Samara is currently over one million, placing it within the **ranks** of the first ten Russian cities.

The first …3…. of Samara in Russian historical **manuscripts go back to** the XVI century; when military **strongholds were erected** along the Volga **to guard** Russia's eastern … 4…. ; the Samara fortress was built in 1586.

By the beginning of the XX century Samara was the most **populous** of the cities along the Volga, and it was one of the most highly-…5…. provinces in Russia. The city **boasted** its own theatre, library, museum and **local** newspaper. Large **detached** houses and **public** buildings, many of which have **survived** to this day, were erected in **variety** of **architectural** styles.

During World War II, Samara was "the second capital" of our country, and many large plants and factories were brought to Samara.

Now Samara is one of the largest …6…. and educational centres of Russia. In the city there are 12 universities, …7…. the Aerospace State University, The Technical University and the Economics University.

---

region - область, регион, край
picturesque - живописный, колоритный
to stretch - тянуться
confluence - слияние
rank - ряд
manuscript - рукопись
go back to - брать начало
stronghold - крепость, цитадель
to erect - воздвигать
to guard - охранять
populous - густонаселенный
to boast - гордиться
local - местный
increasingly - все более, в большей степени
attractive - привлекательный
detached - отдельный
public - общественный
to survive - выжить, уцелеть
variety - разнообразие
architectural - архитектурный

Задание 2. Задайте вопросы к данным ответам.

1. It is currently over one million.
2. No, they don't. They go back to the XVI century.
3. To guard Russia's eastern frontiers.
4. By the beginning of the XX century.
5. Its own theatre, library, museum and local newspaper.

Задание 3. *Напишите данные предложения в правильной последовательности*.

1. With time, the city became increasingly attractive.
2. Welcome to our **hospitable** (гостеприимный) city located in the centre of Russia.

3. 1851 saw the official establishment of the Samara Province, which later developed into the Mid-Volga Region and then into the Samara Territory.
4. The Samara of today is an **amalgam** (сочетание) of the old and the new, it is **constantly** (постоянно) in motion.
5. The **roots** (корень) of Samara's current dynamic industrial development go back into the middle of the XIX century.
6. Samara was founded in 1586 to be followed by those of Syzran and Stavropol (nowadays – Togliatti).

II. Грамматика.

Задание 1. Задайте вопросы к подчеркнутым словам.

The students of our group had to go to the plant last week.

Задание 2. Раскройте скобки, употребляя нужную форму модального глагола.

1. When the fog lifts we (can, could, will be able to, are able to) see where we are.
2. You (must, have to, had to, has to, will have to) read this book. It's really useful.
3. He (can't leave, couldn't have left, couldn't leave, needn't leave), he is ill.
4. At five years old she (could, can, will be able) to read English very well.
5. Mr. Brown (must, have to, had to, has to, will have to) cook his meals because his wife is away.
6. The buses were all full. I (must, have to, had to, has to, will have to) get a taxi.
7. (Can, may, must, should, have to) you show me the way to Trafalgar Square, please?
8. I (can't, couldn't, am able to) find my bag anywhere.
9. You (might have left, must leave, needn't have left, may leave) it in the shop.
10. I phoned him but nobody answered. They (must, had to, must have gone) already.
11. When I first went to Spain I (can, could, was able to) read Spanish, but I (could, can, can't, couldn't, was unable to) speak it.

Лабораторная работа 4

Great Britain

Задание 1. Прослушайте, повторите и запомните слова:

1. political unity - политическое единство
2. decline - упадок, спад
3. chalk and limestone hills - меловые и известняковые холмы
4. major - основной, главный
5. to rely upon imports - полагаться на импорт
6. raw materials - сырье
7. to be responsible for - быть ответственным
8. to submit to - представлять на рассмотрение

9. the party in power - правящая партия
10. the party out of power - оппозиционная партия
11. to supplant - вытеснить, занять место
12. to elect - выбирать
13. to appoint - назначать
14. hereditary - наследственный
15. consumer goods - потребительские товары
16. duration - срок, продолжительность
17. national affairs - внутренние дела

Задание 2. Прочтите и догадайтесь о значении следующих слов:
the United Kingdom, Northern Ireland, England, Wales, population, port, industry, export, import, textile, product, monarchy, parliament, leader, to criticize, motor vehicles, civil, military aircraft, helicopters.
Задание 3. Прочтите и переведите текст.

Great Britain

The United Kingdom of Great Britain and Northern Ireland is the **political unity** of England, Scotland, Wales, Northern Ireland. It is one of the most powerful countries in the world though its importance has shown a marked **decline**.

In mid-1990 the population of Britain was about 58,8 million people and its territory is 245 thousand square kilometers.

In geographical descriptions, Britain is usually divided into two **major** regions: Highland Britain and Lowland Britain. Highland Britain includes Scotland, Lake District, almost the whole of Wales and the **counties** of Devon and Cornwell. Lowland Britain is a rich plain with **chalk and limestone hills**.

The largest cities of Great Britain are: London, Birmingham, Glasgow, Liverpool, Bristol and Cardiff.

Britain's major industries include iron and steel, engineering, including motor vehicles and aircraft, textiles and chemicals. As a result of this Britain's main exports are: **manufactured goods** such as machinery, vehicles, aircraft, metal manufactures, electrical apparatus. Britain's aerospace industry is well known for producing civil and military aircraft, helicopters and space vehicles. However, it should be remembered that Britain **relies** heavily **upon imports** of metal and ores, textile **raw materials** and many other products.

Great Britain is a monarchy, but the power of the Queen is not absolute, but constitutional. The power of the Queen is **hereditary**, and not **elective**. Her powers are limited by Parliament. Parliament consists of two Houses: the House of Commons and the House of Lords. Parliament has a maximum **duration** of five years. The House of Lords is hereditary. The House of Commons is elected and consists of 635 Members of Parliament. The leader of the party that has majority in the House of Commons becomes the Prime Minister of Great Britain. The Prime Minister is appointed by the Queen and all other ministers of the Government are **appointed** on the recommendation of the Prime Minister. He is the virtual ruler of the country, **responsible for** every measure **submitted** to Parliament. Opposition is the name given

in British politics to **the party out of power** whose aim is to criticize and, if possible, **supplant the party in power**.

Among the political parties we can mention the Conservative Party, the Labour Party, the Communist Party and the recently formed Social Democratic Party.

Задание 4. Задайте к тексту письменно 3 специальных вопроса, 2 общих вопроса, 1 альтернативный и 1 разделительный вопросы.

Задание 5. Найдите в тексте английские эквиваленты русских словосочетаний: одна из наиболее развитых стран в мире, в географических описаниях, равнина с меловыми и известняковыми холмами, основные отрасли промышленности, следует помнить, сильно зависит от импорта, сырье для текстильной промышленности, вытеснить правящую партию, наследственная власть, палата общин, палата лордов.

Задание 6. Переведите производные:

politics-politician-political
produce-product-production
constitute-constitution- constitutional
major-majority
lead-leader
rule-ruler-ruling
power-powerful
response-responsible-responsibility

Задание 7. Вставьте пропущенные слова:

1. Counties ……. London are mainly industrial.
2. Newer industries ……. vehicle manufacture, aircraft building, manufacture of a ……. ……. consumer goods.
3. Engineering remains a ……. industry in Scotland.
4. Parliament ……. two Houses.
5. The House of Commons is ……. .
6. The Government is the body of ministers ……. the administration of national affairs.

_____

include, responsible for, wide range of, major, elected, surrounding, consists of.

Задание 8. Согласитесь или опровергните утверждение. Начинайте предложения с фраз: I'm afraid that's wrong; you are quite right/ you are not quite right; that's not quite so; I think you are mistaken; as far as I know; I think so/ I don't think so; according to the text.

1. Great Britain is the most powerful country in the world.
2. England comprises Wales, Scotland and Northern Ireland.
3. England is a highland country.
4. The largest cities of Great Britain are Glasgow, Bombay, Columbus and Dallas.
5. Great Britain exports metal and ores, textile raw materials.
6. Great Britain is an absolute monarchy.
7. Opposition is the party out of power, whose aim is to criticize the Government.

Задание 9. Не глядя в текст, закончите предложения.

1. Britain's major industries include …….

2. Britain relies heavily upon …….
3. Great Britain is a monarchy, but …….
4. The Prime Minister is the leader of …….
5. Parliament consists of ……

Задание 10.Переведите на английский язык.

1. Великобритания – высокоразвитая индустриальная страна, крупный поставщик промышленной продукции и экспортер капитала.
2. Старейшая отрасль английской промышленности – текстильная – утратила прежнее значение.
3. Консервативная партия, крупнейшая политическая партия, образована в 1867 году и насчитывает 3 млн. человек.
4. Лейбористская партия основана в 1900 году. Эта партия насчитывает более 6 млн. человек.

Задание 11. Расскажите по-английски тему “Great Britain”.

Задание 12. Письменно переведите текст.

The original basis of British industry was coalmining. The early factories grew up not far from the mining areas. Glasgow and Newcastle-upon-Tyne, each on a river, became centers of engineering and shipbuilding. Lancashire produced cotton goods and southwest Yorkshire woolens. Sheffield was concentrating on iron and steel. Birmingham and the other towns of the midlands developed light engineering, and later became the chief center for making vehicles. Britain’s main exports are: manufactured goods such as machinery, vehicles, aircraft, metal manufactures.

Контрольная работа 4

I. Чтение.

Задание 1. Прочтите текст и поймите его содержание. Заполните пропуски словами из рамочки:

major, counties, lowland, population, areas, vehicle, goods, engineering, hills, occupies.

England is predominantly a ...1…. country. London, its surrounding ...2…. and the West Midlands generally benefited from the newer industries. These included chemicals, electrical and electronic ...3…., ...4…. manufacture, aircraft building, manufacture of a wide range of ...5…., including food, drink and tobacco products.

Wales is a country of ...6…. and mountains. The country has its own language, spoken by 19% of the ...7….. Agriculture ...8…. about 80% of the land area.

Scotland may be divided into three ...9…. . Engineering remains its ...10…. industry, but there has been a significant trend towards expansion in electronics.

Задание 2. Вам даны ответы. Задайте к ним вопросы.

1. 19 % of the population.
2. 80 % of the land area.

Задание 3. Выберите номера предложений, которые соответствуют содержанию текста:

1. There are upland regions in the North of England.

2. England's major industries include chemicals, electrical and electronic engineering.
3. London and surrounding counties benefited from manufacture of a wide range of consumer goods.
4. Wales is a country of mountains.
5. Wales has its own language.
6. The chief cities of Scotland are Edinburgh, Glasgow and Aberdean.
7. Electronics is the major industry of Scotland.

II Грамматика.

Задание 1. Замените следующие действительные обороты страдательными:

1. The Queen appoints the Prime Minister.
2. Lancashire produced cotton goods.

Задание 2. Укажите предложения, перевод которых следует начинать с предлога:

1. They were listened to with great interest.
2. He is often referred to as the founder of this school.
3. He has never been laughed at before.
4. The visitors were shown new types of machinery.
5. The students have been asked to take part in the discussion.
6. Such difficulties are often met with.
7. The results of this scientific work have been often referred to.

Задание 3. Поставьте глаголы, стоящие в скобках, в нужном времени в страдательном залоге:

Festivals of music and other arts (to hold) every year in many cities in Britain.
London's most famous theatre (to build) in 1662.
The British people (to elect) the House of Commons next year.

Лабораторная работа 5

Higher Education in Great Britain.

I. Read and remember the words and word combinations:

1. provision –обеспечение, запас
2. to determine – определять
3. the National Education Acts – государственные акты об образовании
4. grant – стипендия, денежное пособие
5. graduate – выпускник
6. the Degree of Bachelor of Arts – бакалавр искусств
7. a Master's Degree – учёная степень магистра (присуждается лицам, успешно закончившим год учёбы и исследовательской работы после окончания университета)

8. a Doctor's Degree – учёная степень доктора
9. to set up – учреждать
10. full-time courses – дневная форма обучения
11. sandwich courses – курсы «сандвич» (для работающих, обычно при техническом колледже, где занятия чередуются с работой на предприятии)
12. tie - связь

II. Read and translate the following sentences.

1. The normal length of degree course is three years, after which the students take the Degree of Bachelor of Arts.
2. Graduates who get degrees in engineering, technology, medicine, or maths are almost certain of getting a good job.
3. All Universities receive grants recommended by the University Grants Committee.
4. Cambridge University was set up in the 13th century and grew until today.
5. The Universities of Wales, Oxford, Manchester, Oxford and Cambridge each has over 10,000 full-time students in the academic year.

III. Read and translate Text A.

Life at Colleges and Universities in Great Britain.

There are about one hundred universities in Britain. The oldest and best known universities are located in Oxford, Cambridge, London, Leeds, Manchester, Liverpool and Edinberg.

Good A-level results in at least two subjects are necessary to get a place at a University. However good exams passed alone are not enough. Universities choose their students after interviews. For all British citizens a place at a University brings with it a grant from their local educational authority.

English Universities greatly differ from each other. They differ in date of foundation, size, history, tradition, general organization, methods of instruction, way of student life.

After three years of study a university graduate will leave with the Degree of Bachelor of Arts, Science, Engineering, Medicine, etc. Later he may continue to take a Master's Degree and then a Doctor's Degree. Research is an important feature of university work.

The two intellectual eyes of Britain – Oxford and Cambridge Universities – date from the 12th and 13th centuries.

In the 19th and the early part of the 20th centuries the so-called Redbrick universities were founded. These include London, Manchester, Leeds, Liverpool, Sheffield and Birmingham. During the late sixties and early seventies some 20 “new” universities were set up. Sometimes they are

called “concrete and glass” provide two-year courses in teacher education or sometimes three years if the graduate specializes in some particular subject.

Some of those who decide to leave school at the age of 16 may go to a further education college where they can follow a course in typing, engineering, town planning, cooking, or hairdressing, full-time or part-time. Further education colleges have strong ties with commerce and industry.

Some 80,000 overseas students study at British universities or further education colleges or train in nursing, law, banking or in industry.

IV. Translate the following word combinations from the text.

Constitutional provisions for education; is determined; are located; at least; to get a place; passed alone; brings with it a grant; differ in; general organization; methods of instruction; a university graduate; an important feature; the two intellectual eyes; date from; “concrete and glass” universities; full-time and sandwich courses; some particular subject; a further education college; strong ties with commerce and industry; overseas students.

V. Answer the questions according to the text.

1. What is the system of education of Great Britain determined by?
2. How many universities are there in Great Britain?
3. What are the oldest and best-known universities in Britain ?
4. How is it possible to get a place at a university?
5. English universities greatly differ from each other, don't they?
6. When were 20 “new” universities set up?
7. Where may those who decide to leave school at the age of 16 get education?

VI. Fill in the blanks. The words are given below.

1. Universities in Great Britain have complete academic _____ .
2. British Universities are centers of teaching as well as _____ .
3. During the late sixties and early seventies some “new” universities were _____ .
4. English Universities greatly _____ from each other.
5. Post-graduate students in Great Britain are doing research for _____ .

_____

differ, higher degrees, set up, research, freedom

VII. Correct the following statements.

1. Great Britain has written constitution, so there are constitutional provisions for education.
2. There are about fifty universities in Britain.

3. Good exam passed alone are enough to get a place at a university.
4. After three years of study a university graduate will leave with a Doctor's degree.
5. Further education colleges have no ties with commerce and industry.

VIII. Make up a dialogue comparing higher education in Great Britain and in Russia. Use the vocabulary of this lesson.

IX. Retell the text “Life at Colleges and Universities in Great Britain”.

X. Read and translate Text B.

Oxbridge.

Oxford and Cambridge are the oldest and most prestigious universities in Great Britain. They are often called collectively Oxbridge. Both universities are independent. Only the education elite go to Oxford or Cambridge. Most of their students are former public schools leavers.

The normal length of the degree course is three years, after which the students take the Degree of Bachelor of Arts (B.A.). Some courses, such as languages or medicine, may be one or two years longer. The students may work for other degree as well. The degrees are awarded at public degree ceremonies. Oxford and Cambridge cling to their traditions, such as use of Latin at **degree ceremonies**. **Full academic dress** is worn at examinations.

Oxford and Cambridge universities consist of a number of colleges. Each college is different, but in many ways they are alike. Each college has its name, its **coat of arms**. Each college is governed by a **Master**. The larger ones have more than 400 members, the smallest colleges have less than 30. Each college offers teaching in a wide range of subjects. Within the college one will normally find a chapel, a dining hall, a library, rooms for **undergraduates, fellows** and the Master, and also rooms for teaching purposes.

Oxford is one of the oldest universities in Europe. It is the second largest in Britain, after London. The university’s earliest **charter** is dated to 1213.There are now twenty-four colleges for men, five for women and another five which have both men and women members, many from overseas studing for higher degrees. Among the oldest colleges are **University College, All Souls, and Christ Church.**

Cambridge University started during the 13th century and grew until today. Now there are more than thirty colleges.

On the banks of the river Cam willow trees drown their branches into the water. The colleges line the right bank. There are beautiful college gardens with green lawns and lines of tall trees. The oldest

college is Peterhouse, which was founded in 1284, and the most recent is Robinson College, which was opened in 1977.

The University was only for men until 1871, when the first women's college was opened. In the 1970s, most colleges opened their doors to both men and women. Almost all colleges are now mixed

The universities have over a hundred societies and clubs enough for every interest one could imagine. Sport is a part of students'life at Oxbridge. The most popular sports are rowing and punting.

References:

1. degree ceremony – церемония вручения ученых степеней
2. full-academic dress – парадная форма одежды
3. coat of arms – герб
4. undergraduate – студент университета
5. fellow – младший научный сотрудник колледжа или университета
6. Master – глава колледжа
7. charter – грамота; устав
8. University College - Юниверсити-Колледж (основан в 1249г.)
9. All Souls – Олл-Соулз, Колледж Всех Душ (основан в 1438г.)
10. Christ-Church – Крайст-Черч (один из самых крупных аристократических колледжей Оксфордского Университета; основан в 1525г.)

XII. Make up 10 questions according to the text (general, to the subject, special, alternative). Do it in written form.

XIII. Tell about Oxbridge in English.

Лабораторная работа 6

Radioengineering

I. Read and memorize the following words:

1. convincingly – убедительно
2. to enumerate – перечислять
3. keynote – ведущая идея, тенденция; основное направление
4. indispensable – необходимый, обязательный, незаменимый
5. chair – зд. кафедра (в вузе)
6. vital – насущный; существенный, очень важный, крайне необходимый

7. consumer electronics – бытовая электронная аппаратура
8. to meet the requirements – удовлетворять требования, потребности
9. to qualify – готовить к какой-либо деятельности; обучать для какой-либо цели
10. within the framework of smth – в рамках (в пределах) чего-либо
11. electronic reconnaissance – радиоэлектронная разведка
12. electronic countermeasures – радиоэлектронное противодействие
13. aircraft defence – защита летательного аппарата
14. to master – овладевать (знаниями, навыками)
15. circuitry – схемотехника
16. systems engineering – системотехника
17. aerial – антенна
18. circuit component – компонент схемы, схемный элемент
19. computer – aided design – автоматизированное проектирование
20. treatment – лечение
21. life-support system – система жизнеобеспечения
22. facility – обыкн. pl средства; возможности, благоприятные условия; оборудование, устройства
23. opportunity – удобный случай; благоприятная возможность
24. to acquire – приобретать, получать; овладевать (знаниями)
25. profound – глубокий, основательный

II. How are the following words formed? Analyse their structure and give more examples of similar word formation.

Convincingly, powerful, exploration, development, technological, competitive, different

III. Make sure that you know the words below. What parts of speech do they belong to and what derivatives can they form?

Believe, promise, prove, grow, lead, manage, demand, establish, special, research, design, miniature, consume, amplify, gain

IV. Match up the synonyms

a) promising, indispensable, importance, to raise, application, modern, to demand, deep, qualified, to gain, research, to allow
b) contemporary, to increase, skilled, to permit, significance, to require, use, perspective, investigation, necessary, to acquire, profound

V. Why have you chosen the radioengineering department? Can you explain your choice? Have you known anything about the department before entering the university? Share your views on your future occupation.

VI. Study the text carefully

Radioengineering

Electronics is believed to be a rather young and a very promising science. Recent years have proved convincingly the growing importance of electronics in modern society. It has opened a new era and has become a powerful means of progress. At present it is difficult to enumerate all branches of science and technology based on electronic techniques.

Automation is the industrial keynote of the day. Electronics makes it possible to raise industrial automation to a higher level. Electronics leads to automatic control of large-scale industrial operations. Electronics is used nearly in all spheres of human life. Electronic techniques are indispensable in communication, radio astronomy, space exploration, nuclear physics, economics and management.

The rapid development of electronics and its growing application demand a great number of qualified engineers in this field. Such qualified specialists are trained at the radioengineering department of Samara State Aerospace University. The radioengineering faculty was established in 1959. Today the faculty is a large university department training highly – qualified specialists in the field of radioelectronics. Special chairs of the faculty carry on research of the most vital problems of modern radioengineering, namely, space radioelectronics, microelectronics, microminiaturization of radioelectronic apparatus, automation of designing.

The faculty trains engineers in the following specialities: “Radioengineering”, “Design and technology of radioelectronic apparatus”, “Consumer electronics”, “Biotechnical and medical apparatus and systems”.

To meet the requirements of the industrial development of the region engineers are qualified in a number of specializations created within the framework of the basic specialities, namely, automobile electronics, space apparatus construction, electronic reconnaissance and electronic countermeasures, technology of microelectronic devices, design and technology of electronic aircraft defence apparatus.

Students mastering the speciality of a radioengineer gain deep knowledge of circuitry and systems engineering of radioelectronic devices and systems. Students study radioreceiving and transmitting devices, radiolocation, radionavigation, radiocontrol, aerials, amplifying devices and other subjects.

The training of radiodesigners allows to master modern methods of designing of radioelectronic apparatus for different purposes, including microelectronic devices for space apparatus, consumer and industrial electronics. Future specialists study modern and perspective circuit components and their optimized application, fundamentals of radioelectronics, microelectronics and microminiaturization, physical and mathematical modeling, computer-aided design and automation of technological processes of electronic apparatus production.

Students studying medical apparatus and systems get necessary knowledge for development, research and operation of biotechnical and medical electronic devices and computer systems for different purposes, namely, apparatus and computer systems for treatment and diagnosis in medicine, medical and biological apparatus of life-support systems and medical control systems, satellite devices in cosmonautics.

The radioengineering department has all the necessary facilities for studying and research including laboratories equipped with modern devices, computer classrooms. Students are given every opportunity for acquiring profound knowledge of their future speciality to become highly-qualified and competitive specialists in the most perspective spheres of activity.

VII. Find in the text the equivalents of the following phrases. Suggest another word which could be used instead to give the same meaning:

A very perspective science; contemporary society; the increasing significance of electronics; the industrial tendency; all spheres; to increase industrial automation; the fast development; to require a large number of skilled engineers; to conduct an investigation of the most essential problems; on the base of the main specialities; to get profound knowledge; to quality engineers; to be provided with all indispensable means.

VIII. Ask questions to which the following statements could be answers.

a. Electronics has become a powerful means of progress.
b. Electronics techniques are widely used in industry, in space exploration, in communication, in economics.
c. Highly – qualified specialists in the field of radioelectronics are trained at the radioengineering department of SSAU.
d. Engineers are trained in a number of specialities and specializations to meet the requirements of the modern industrial development.
e. The training of engineers allows to gain profound knowledge in the field of modern radioengineering.

IX. Select in the text the terms associated with the sphere of radioengineering. Try to explain them and use in your own sentences and situations.

X. Express your views on the role of electronics in modern society and its perspectives in future. Do you agree that electronics is one of the most promising sciences and its importance will increase in future? Supply your opinion with arguments, proofs and facts.

XI. Make a presentation of your department concentrating on the quality of the training, a variety of facilities it provides to attract prospective students.

XII. Read the text and discuss the basic phenomena of electronics.

Electronics

Electronics is the field of science and engineering dealing with the release[1], transport, control, collection, and energy conversion of subatomic particles having mass and charge (such as electrons) acting in materials with known electromagnetic properties, e.g., vacuum, gases, or semiconductors. The charged particles are called charge carriers.

The phenomena of electronics depend upon the number of participating charge carries, their dynamic activity, and the properties of the environment in which the charges act. The charge carries are usually electrons, but they may be holes or positive or negative ions. The dynamic activity of charge carriers results from the force and

recoverable[2] energy needed to release them from atoms to produce their displacement[3], velocity or acceleration in accordance with the principles of relativistic quantum mechanics. The properties of the environment depend upon the composition, structure and changes in energy levels of atoms composing the substance through which charge carriers pass.

The basic principles of electronics are the same as those of electricity and magnetism. Electricity is any manifestation[4] of energy conversion of charge carriers that initiates or yields[5] forces producing displacement, velocity or acceleration in the direction of their movement. Magnetism is any manifestation of the kinetic energy of charge carriers arising from or producing forces in a direction perpendicular to their motion. The principles of electronics and electromagnetism are built upon the physical entities[6] of mass, length, time, electric charge (or current), temperature, amount of substance and luminous intensity[7].

The primary differences between electronics and electromagnetism lie in their applications. Compared with the traditional field of electromagnetism, electronics makes possible devices having much greater degree of control over the instantaneous[8], rather than the average, movement of charges during transport, and the control of charges can be exceedingly[9] rapid. Active election devices require an external source of power to maintain their electrodes at suitable operating voltages and currents. Electron devices are also, for the most part, nonlinear elements whose output voltages and current are disproportionately related to their input counterparts[10]. At the expense[11] of power from an external supply, many electron devices can provide at their output terminals an amplified version of the voltage, current, or power supplied to their input terminals.

Originally electronics dealt with the conduction of electricity in vacuum or gaseous tubes[12]. Since the invention of the transistor in 1948 conduction through crystalline semiconductors (solid – state conduction) has virtually[13] dominated the field, and thermionic electron tubes have played a role of diminishing[14] importance except for applications requiring high power.

Notes to the text

1. release n., v. – о (вы-) свобождение
   о (вы-) свобождать
2. recoverable – возместимый, восстанавливаемый
3. displacement – смещение, сдвиг
4. manifestation – проявление, обнаружение
5. to yield – производить; приносить, давать что-либо
6. entity – нечто реально существующее; сущность, существо
7. luminous intensity – сила света
8. instantaneous – мгновенный, моментальный
9. exceedingly – чрезвычайно, крайне
10. counterpart – двойник, копия
11. at the expense – за счет чего-либо, ценою чего-либо
12. gaseous tube – лампа с газовым наполнением
13. virtually – фактически; по существу, на деле
14. diminishing – уменьшающийся, убывающий

XIII. Find in the text the English equivalents of the following Russian phrases

Высвобождение, перемещение, управление, сбор и преобразование энергии субатомных частиц; материалы с известными электромагнитными свойствами; явления электроники; динамическая активность носителей заряда; принципы релятивистской квантовой механики; состав, структура и изменения энергетических уровней атомов; любое проявление преобразования энергии носителей заряда; физические сущности массы, длины, времени, заряда, температуры, количества вещества и силы света; поддерживать электроды на соответствующем уровне рабочих напряжений и тока; усиленную величину напряжения, тока или мощности, подаваемых на входные терминалы; применения, требующие высокой мощности.

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

1. Definition of electronics.
2. Dependence of the phenomena of electronics on the properties of the environment.
3. The properties of charge carriers.
4. Dependence of the environment on the electromagnetic field.
5. The similarity and difference between the basic principles of electronics and electricity and magnetism.
6. Advantages and drawbacks of electron devices.
7. The great importance of thermionic electron tubes in modern electronics.

XV. Divide the text into logical parts and entitle them. Write an outline of the text. Speak on the basic phenomena and basic principles of electronics according to your outline.

XVI. Match the term from the list with corresponding definitions and descriptions given below.

Voltage, electric conduction, charge release, charge transport, energy conversion.

1. Once mobile charges are released from their host material, they may be set into motion and given kinetic energy by means of an applied electric field. A magnetic field can be used to accelerate charge carriers in a direction perpendicular to that of their velocity.
2. The amount of energy per charge between two points, whether due to separation of charges (as in electrostatics) or to changes of energy in dynamic processes. A drop of this value exists when the energy of charges in diminished as charges do work. A value rise exists when the energy of charges in increased by some source of energy that does work on them. The total value rise is equal to the total value drop when values are measured in the same direction around a closed loop.
3. The transmission of charge carriers through, or by means of, electric conductors. The conductors may be in the solid liquid or gaseous state each of which exhibits different mechanisms of charge transfer. The atomic structure of materials greatly influences the facility with which charges can

be transmitted. The environment in which the conductor is located also modifies the conductivity, sometimes to a remarkable extent.

4. Energy in a system can be neither created nor destroyed (except in nuclear processes when energy is converted into its equivalent form, mass). However, one form of energy can be converted into other forms. Thus, the potential energy of a system can be converted into kinetic energy and vice versa, and the energy of particles of one kind can be converted into energy of particles of quite another kind. Heat, produced by the random motion of elementary particles and their aggregates, is the form energy into which other forms are ultimately converted.
5. The mobile charges required to establish an electric current are released by applying force to, and expending energy on, material substances. Mobile charges, may be released by heat, electromagnetic radiation, impact of particles, intense electric field, and the tunneling effect, by which an electron crosses a potential barrier.

Лабораторная работа 7

The history of radio

I. Read and remember the new words:

1. to involve – вовлекать, включать в себя
2. to allow – позволять, предоставлять
3. to extend – вытягивать, расширять, простираться
4. instant – мгновенный, одновременный
5. broadcasting – радиовещание
6. giant – гигантский
7. a rod – прут
8. although – несмотря на
9. to exploit – разрабатывать
10. entire – целый, всецелый

II. Read and translate the following sentences.

1. George Fitzgerald exploited a method by which electromagnatic waves might be produced by the discharge of a condenser.
2. Nowadays local radio stations broadcast their own programmes in addition to relaying central radio broadcast programmes.
3. Radio devices have made it possible the information to be optained instantly about the extended places in far-away Galaxies.
4. Radio engineering involves such branches as television, remote control of different equipment by means of radio, radio-location, radio navigation, etc.
5. The story of radio begins with Joseph Henry in 1842. A gigantic step forward was taken by James Maxwall, who showed that all electrical and magnatic phenomena could be reduced to stresses and motions in a medium.

III. Read and translate the text.

The History of Radio.

With the development of wireless, we moved a big step closer to a "joined up world" – in which every part of Earth was brought within instant contact. The technological developments that made this possible **involved** wireless going to sea and taking to the air. The development of radio telephony **allowed** real conversations over the airwaves – and **extended** the reach of the telephone. Radio was the first means of **instant** mass communication – the first time it had been possible to talk to whole populations at once. From the late 1920s on, important events started to become shared experiences for **entire** natins

In Britain the technology of **broadcasting** evolved rapidly so that in just ten years it was accessible to million of people all over the country.

Heinrich Hertz was the first man to transmit an electrical current between two points without using a wire, paving the way for radio. In a corner of his politechnic laboratory in Berlin, he made an electric charge jump from one metal **rod** to another. This small leap was a **giant** step. It proved that electromagnatic waves did exist and also that they moved at the speed of light. **Although** an amusement for the students, Hertz could find no practical use at all for this discovery. It was left to A.Popov **to exploit** the idea for transmitting radio.

Alexander Popov invented a wireless communications system in 1895. He grew up in Turinsk mining district of Russia, the son of a priest. He studied maths and physics in St.Petersburg, then started teaching physics and researching at the naval warfare institute.

Popov was trying to detect thunderstorms in advance by picking up static electrical signals, which led him to experiment with wireless. In May 1895 he transmitted a signal a modest 600 yards, and within two years his wireless system had been installed on Russian naval vessels and land stations. In 1900, the radio saved hundreds of lives when it was used for the first time to launch a rescue mission for a ship in distress.

IV. Translate the following word combinations from the text.

Moved a big step; instant contact; shared experiences; paving the way; electric charge jump; the naval warfare institute; naval vessels; in distress; a joined up world; mining district of Russia.

V. Answer the questions according to the text.

1. What moved a big step closer to a "joined up worked"?
2. What did the development of radio telephony allow?
3. When did the technology of broadcasting in Britain evolve rapidly?
4. What scientist paved the way for radio?
5. What experiment did Heinrich Hertz conduct in his laboratory in Berlin?
6. When did Popov invent radio?
7. What led Popov to his experiment with wireless?

VI. Fill in the blanks. The words are given below the line.

1.The technological developments _____ wireless going to sea and taking to the air.
2. Radio was the first means of _____ mass communication.
3.This small leap was a _____ step.
4.It was leaft to Popov _____ the idea for transmitting radio.
5. Popov was trying to detect thunderstorms in _____ by picking up static electrical signals.
6.The radio was used to launch a rescue mission for a ship in _____ .
7.In Britain the _____ evolved rapidly in 1920s.

Destress, broadcasting, involved, giant, advance, instant, to exploit

VII. Correct the statements using the vocabulary.

1. With the development of the telephone it became possible to talk to the whole population at once.
2. From the late 1940s on, important events started to become shared experience to entire nations.
3. James Clerk Maxwell was the first man to transmit an electrical current.
Herts found practical use for his discovery.
4.Alexander Popov invented a wireless communications systems in 1885.
5. Popov grew up in the capital of Russia, Moscow.
6. Picking up static electrical signals led Popov to experiment with telephone.

VIII. Retell the text “The history of radio” in English.

IX. Read and translate Text B.

Some Facts from the History of Radio.

Radio owes its development to two other inventions, the telegraph and the telephone, all three technologies are closely related.

Few radio broadcasts travel through the air exclusively, while many are sent over telephone wires. In the 1860s, James Clerk Maxwell, a Scottish physicist, predicted the existence of radio waves, and in 1886 Heinrich Rudolph Hertz, a German physicist, demonstrated that rapid variation of electric current could be projected into space in the form of radio waves similar to those of light and heat.

Guglielmo Marcony, an Italian inventor, proved the feasibility of radio communication. He sent and received his first radio signal in Italy in 1895. By 1899 he flashed the wireless signal across the English Channel and two years later received the letter “S”, telegraphed from England to Newfoundland. This was the first successful transatlantic radiotelegraph message in 1902.

Wireless signals proved effective in communication for rescue word when a sea disaster occurred. Effective communication was able to exist between ships and to

shore points. A number of ocion liners installed wireless equipment. In 1899 the United States Army established wireless commendations with a lightship off Fire Island, New York. Two years later the Navy adopted a wireless system. Up to then, the Navy had been using visual signaling and homing pigeons for communication.

In 1909, Robert E. Peary, arctic explorer, radiotelegraphed: “I found the Pole”. In 1910 Marcony opened regular American-European radiotelegraph service, which several months later, enabled an escaped British murderer to be apprehended on the high seas. In 1912, the first transpacific radiotelegraph service linked San Francisco with Hawaii.

During World War I, governments began using radiotelegraph to be alert of events and to instruct the movement of troops and supplies. World War II demonstrated the value of radio and spurred its development and later utilization for peacetime purposes. Radiotelegraph circuits to other countries enabled persons almost anywhere in the United States to communicate with practically any place on earth.

X. Make up 10 questions according to the text.

Лабораторная работа 8

Lasers and Masers

I. Read and remember the new words.

1. unlike - в отличие
2. flash lamp - импульсная лампа
3. similar - подобный, похожий
4. intense - интенсивный
5. coherence - когерентность
6. directionality - направленность
7. area - область
8. dozen - дюжина
9. sensitive - чувствительный, восприимчивый
10. accuracy - точность

II. Translate the following sentences.

1. If treated inadequately, an extremely powerful beam of light can be a source of destruction.
2. Looking directly into the beam or its reflection from a shiny object you can damage your eyes.
3. Lasers are based on a simple principles of atomic behavior.
4. Nearly all atoms, ions, or molecules of the lasing medium are at their lowest energy level or “ground state”.
5. Maser have made revolutionary advance possible in a number of different fields.

III. Match the English words and expressions with their Russian equivalents.

1. light amplification	a) усилитель
2. spontaneous emission	b) вынужденное излучение
3. stimulated emission	c) излучение; радиация
4. radiation	d) спонтанное излучение
5. oscillator	e) усиление света
6. amplifier	f) возбужденная частица
7. ground state	g) генератор
8. population inversion	h) высший энергетический уровень
9. excited particle	i) основное состояние
10 upper energy level	j) инверсия заселенности

IV. Read and translate the text.

Lasers and Masers

A laser is a source of light but **unlik**e anything that had ever been seen before 1960. In that year TheodoreH. Maiman of Hughes Aircraft placed a specially prepared synthetic ruby rod inside a powerful **flash lamp similar** to the type used for high-speed photography. Activating the flash lamp produced an **intense** pulse of red light, which possessed the unique properties of monochromicity, **coherence** and **directionality.**

With Maiman's invention the laser age was born. Everybody became interested in exploring this promising **area** of science. Within a very short time, numerous solid-state materials, gases, liquids, and semiconductor crystals were found possessing laser qualities.

The word "laser" is an acronym standing for light amplification by stimulated emission of radiation. This is not exactly so since most lasers are actually oscillators and not amplifiers, though such lasers are also possible and used for some applications.

The unique characteristics of lase light make numerous applications possible. It would be hard to imagine the modern world without lasers. They are used in everything from CD players to laser printers, fibre-optics and free space communications, industrial cutting and welding, medical and surgical treatment, holography and light shows, basic scientific investigations in **dozens** of fields, including Star Wars weapons research.

The word "maser" is also an acronym for microwave amplification by stimulated a mission of radiation. The maser is operated on the same principle as the laser except that the wavelengths generated are much longer. Masers have made revolutionary advance possible in a number of different fields. They are up to 1000 times more **sensitive** than any other type of amplifiers. Because of the very constant frequency with which masers can be made to oscillate they can be used as master controls for atomic clocks of unbelievable **accuracy.**

V. Provide detailed answers to these questions.

1. What is a laser? What other sources of light do you know?
2. What was the first laser like?
3. Does the laser possess any unusual properties? What are they?
4. When did the laser age begin?
5. Many substances produce laser light, don't they?
6. Why is it difficult to imagine our life without lasers?
7. What are the most common uses of lasers?
8. Why are lasers considered dangerous?
9. What is a maser? What is the difference between lasers and masers?
10. Where can masers be used?

VI. Find the correct definition for the following terms.

1.The light is of the same wavelength or colour.
2. All the waves move precisely in step.
3. The beam can be easily manipulated.
4. Generators or sources of light.
5. Devices for increasing the strength of a signal.

Oscillator, directionality, monochromicity, amplifier, coherence

VII. Complete the gaps with suitable words from the box.

wavelength	destruction	applications
safety	liquids	intense
powerful		
features	coherence	semiconductor

A laser is a source of monochromatic, directional and coherent light. Monochromicity means light of the same _____ or colour. Light waves travelling precisely in step explain the property of _____ . Besides, the laser beam can be easily manipulated. These unusual _____ make laser light unique. The first laser consisted of a specially prepared synthetic ruby rod and a _____ flash lamp. During the experiment the researches observed an _____ pulse of red light. Later solid-state materials, gases, _____ and _____ crystals were recorded having laser qualities. Lasers are considered to be a multibillion-dollar industry having numerous _____ such as cutting and welding. However, lasers can be the source of both construction and _____ . That is why _____ rules must be strictly observed.

VIII. Translate the following text into Russian. Use the dictionary if necessary.

Lasers in Art and Entertainment

Lasers make impressive visual effects possible. In light shows it is common to use lasers emitting few laser wavelengths. Prisms are used for separating each colour. This results in producing many laser beams of different colours. The application of small vibrating mirrors controlled by a computer provides the possibility of moving each laser beam very rapidly thus creating moving coloured images. Since our version is based on seeing the image a little time after it has disappeared, we are capable of observing a full picture created by a laser beam in spite of its being illuminated in each point for a very brief period of time. The first devices were used for making two-dimensional moving pictures on screens, but the latest developments are designed with the view of producing three-dimentional moving sculptures in free space – an impossible task to be performed by other means. Without the laser, the unique three-dimentional imaging properties of holography would not exist.

IX. Explain the meaning of these words and expressions.

Laser, oscillator, amplifier, photon, “ground state”, “spontaneous emission”, “stimulated emission”

X. Match the words with the similar meaning.

synthetic	features
exactly	powerful
characteristic	usage
application	to offer
to suggest	to possess
single	artificial
strong	precisely
to have	separate

XI. Translate the sentences into English using your active vocabulary.

1. Имея разные уровни энергии, электроны нижних уровней могут переходить на более высокие путём поглощения света или тепла.
2. Без использования лазера голограмма невозможна.
3. Используя новый метод, они изменили спектр света.
4. Получение мощного луча возможно только с помощью лазера.
5. Проводя эксперименты с лазером, профессор объяснил студентам принцип его работы.
6. Выполнение этой работы требует опыта.
7. Что такое “melting substance”? – Это вещество, которое плавится.

Лабораторная работа 9

Computers

I. Read and memorize the following words:

1. to process data – обрабатывать данные
2. to feed – подавать, вводить
3. to run a program – запускать программу
4. software – программное обеспечение
5. hardware – аппаратное обеспечение
6. to execute – выполнять
7. to hold – держать
8. to extract – извлекать
9. configuration – конфигурация, состав
10. input/output device – устройство ввода/вывода

II. Read the following international words and try to guess their meaning:

machine, data, electronic, result, program, form, mechanical, system, standard, section, component, instruction, coordinate, physical, product, panel.

III. Translate the derivatives define to what parts of speech they belong:

1. accept – acceptable – acceptance
2. process – processing – processed
3. inform – information – informed
4. execute – executive – executant
5. act – active – activity;
6. provide – provision – provided
7. store – storage – stored.

Text A
What is a computer?

Computers are electronic machines which can accept data in a certain form, process the data and give the results of the processing in a specified format as information.

Three basic steps are involved in the process. First, data is fed into the computer's memory. Then, when the program is run, the computer performs a set of instructions and processes the data. Finally, we can see the results (the output) on the screen or in printed form.

Information in the form of data and programs is known as software, and the electronic and mechanical parts that make up a computer system are called hardware. A standard computer system consists of three main sections: the central processing unit (CPU), the main memory and the peripherals.

Perhaps the most influential component is the central processing unit. Its function is to execute program instructions and coordinate the activities of all the other units. In a way, it is the 'brain' of the computer. The main memory holds the instructions and

data which are currently being processed by the CPU. The peripherals are the physical units attached to the computer. They include storage devices and input/output devices.

Storage devices (floppy, hard, or optical disks) provide a permanent storage of both data and programs. Disk drives are used to handle one or more floppy disks. Input devices enable data to go into the computer's memory. The most common input devices are the mouse and the keyboard. Output devices enable us to extract the finished product from the system. For example, the computer shows the output on the monitor or prints the results onto paper by means of a printer.

On the rear panel of the computer there are several ports into which we can plug a wide range of peripherals – modems, fax machines, optical drives and scanners. These are the main physical units of a computer system, generally know as the configuration.

IV. Match the terms in the box with the appropriate definition:

a) monitor;	d) port;	g) printer;
b) floppy disk;	e) output;	h) mouse;
c) input;	f) CPU;	i) keyboard.

1. An output device which converts data into printed form.
2. The information, which is presented to the computer.
3. The brain of the computer.
4. A small input device with a ball underneath that is rolled by the user to specify the position of the cursor or to makes choices from the menu.
5. Results produced by the computer.
6. Any socket or channel in a computer system into which an input/output device may be connected.
7. An input device with typewriter keys for letters, numbers and line controllers.
8. Small device used to store information. Same as 'diskette'.
9. Visual display unit.

V. Find in the text English equivalents of the following phrases and words:

электронные машины; получать данные; данные вводятся в память компьютера; ряд инструкций; самый важный компонент; запоминающее устройство; дисковод; давать возможность (позволять); подключать.

VI. Say if the following statements are true or false. Correct the wrong statements, using the phrases below:

I'm afraid that's wrong;
you are not quite right;
that's not quite so;
I think you are mistaken;
I don't think so.

1. Computers are electronic machines which can accept data in any form.
2. A standard computer system consists of four main sections.
3. Perhaps one of the most influential components is the CPU.
4. The main memory holds the instructions and data.

5. The peripherals include storage devices and input/output devices.
6. Dick drives are used to handle one or two floppy disks.

VII. Complete the sentences.
1. Computers are electronic machines which can…
2. Three basic steps involved in the process are the following…
3. Information in the form of data and programs is known as…
4. A standard computer system consists of three main sections…
5. The central processing unit is…
6. The peripherals are…
7. Storage devices provide…
8. Input devices enable data…
9. Output devices enable us…
10. On the rear panel of the computer there are several ports…
11. These are the main physical units of a computer system…

Text B
Computer Applications

I. Read and memorize the following words:
1. to perform – выполнять, производить;
2. computer aided design – система автоматизированного проектирования;
3. to provide – обеспечить, предоставлять;
4. to access – получить доступ;
5. to rely on – полагаться на;
6. to manage – управлять.

(1) Computers can help students perform mathematical operations and solve difficult questions. They can be used to teach courses such as computer-aided design, language learning, programming, mathematics, etc.

PCs (personal computers) are also used for administrative purposes: for example, schools use databases and word processors to keep records of students, teachers and materials.

(2) Race organizers and journalists rely on computers to provide them with the current positions of riders and teams in both the particular stages of the race and in the overall competition.

Workstations in the race buses provide the timing system and give up-to-the-minute timing information to TV stations. In the press room several PCs give real-time information on the state of the race. Computer databases are also used in the drug-detecting tests for competitors.

(3) Computers store information about the amount of money held by each client and enable staff to access large databases and to carry out financial transactions at high speed. They also control the automatic cash dispensers which, by the use of a personal coded card, dispense money to clients.

(4) Airline pilots use computers to help them control the plane. For example, monitors display data about fuel consumption and weather conditions. In airport control towers, computers are used to manage radar systems and regulate air traffic. On the ground, airlines are connected to travel agencies by computer. Travel agents use computers to find out about the availability of flights, prices, times, stopovers and many other details.

II. When you read texts like these, you don't always need to understand every word. But there are words which you can guess from the context. Look at these words. Are they nouns, verbs or adjectives?

1. workstation; 2. data; 3. perform; 4. automatic; 5. monitor;
6. financial; 7. store; 8. connected; 9. word processor; 10. large.

III. Now find the words in texts 1 to 4, and match them with the meanings below.

a) information;
b) execute (do);
c) connected with money;
d) keep (save);
e) massive;
f) linked;
g) self-acting, mechanical;
h) screen;
i) powerful computer usually connected to a network;
j) program used for text manipulation.

IV. Look at text 1 again and discuss these questions.
1. How are/were computers used in your school?
2. What other areas of study would benefit from the introduction of computers?

Лабораторная работа 10

Robots

I. Read and memorize the following words:

1. numerous – многочисленный
2. attempt n. – попытка
3. to coin – создавать новые слова, выражения
4. playwright – драматург
5. to deprive – лишать
6. steam engine – паровой двигатель
7. wrist – запястье
8. gripper – захват, зажим; захватное устройство; клещи
9. essential – необходимый; существенный, существенно важный
10. adaptive – приспособляющийся, адаптивный
11. to forge – ковать
12. foundry work – литейная работа
13. rigid – жесткий, устойчивый; фиксированный
14. to possess – обладать, владеть
15. tactile – осязательный
16. magnitude – величина; размеры
17. subsequently – впоследствии, затем
18. to appraise – оценивать
19. purposeful – целеустремленный, целенаправленный
20. therefore – по этой причине; поэтому, следовательно
21. to exclude – исключать

II. How are the following words formed? Analyse their structure and give more examples of similar word formation.

Playwright, civilized, individuality, microprocessor, automatically, intellectual, processing, generation, purposeful, scientific, different, productivity.

III. Make sure that you know the words below. What parts of speech do you they belong to and what derivatives can they form?

Create, invent, move, join, repeat, adapt, instruct, react, improve, prevent, true, brain, memory, locate, drive, means, impossible, serve.

IV. Define if the following pairs of words are synonyms or antonyms. Give the Russian equivalents of the words.

attempt – effort; to call – to name; artificial – natural; to appear – to emerge; to deprive – to gain; to consist – to comprise; varying - the same; to include – to exclude; magnitude – value; difference – similarity; to appraise – to evaluate; essential – unnecessary; to carry out – to perform; to divide – to add; to define – to determine; beam – ray.

V. Read and translate the text.

Robots

Man has always been interested in devices which facilitate life. Numerous attempts to create such devices resulted in the development of robots.

Almost everyone is familiar with the word “robot” in our civilized society. It was coined by a Czech playwright Karel Capek and used for the first time in the drama title “Rossum’s Universal Robots”. K. Capek called men who were deprived individuality and became like machines robots in his play by parodying the word “robota” meaninig slave labour.

A robot is thought to be a man-made machine that does the work of a human being and looks like him. One of the first true robots was an invention made by James Watt, the same man who invented the steam engine.

Real progress in robot making began in the late eighteenth and nineteenth centuries during a period called the “Industrial Revolution”. But it was not until electronic computers gave machines a “brain” and a “memory” that true robots began to appear. Electronics brains give automatic devices a memory and can instruct them what to do under varying conditions.

A robot is a machine which moves, manipulates, joins or processes components in the same way as human hand or arm. It consists of three elements: the mechanical structure (including the artificial wrist and gripper), the power unit (hydraulic, pneumatic or electrical) and the control system (minicomputers and microprocessors). However, the essential characteristic of a robot is that it can be programmed to carry out and repeat a series of operations. A robot is defined as a hybrid of mechanical, electrical and computing engineering.

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

All the industrial robots in stamping, mechanical processing, forge and foundry work, in loading and unloading belong to the first generation – the programmed robots. Characteristic of the first generation robots is that their control system acts according to a rigid often – repeated programme all the time.

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

The third generation – intellectual robots possess far richer means for sensing (including sight), for appraising the situation, and for processing information with a view to adopting a decision and carrying it out using drives and organizing the purposeful movement of the manipulator.

Therefore, the intellectual robots can be considered as the machines possessing elements of artificial intellect. However, this doesn’t enable to exclude a human operator in solving complicated problems demanding human experience.

Robots serve mankind in thousands of ways. They can operate practically anywhere, perform a great variety of duties and do many things that would be physically impossible for a man.

Robots are very helpful in different industries, in scientific and research laboratories, in space exploration. The use of robots has produced a number of economic and social advantages such as the improvement in productivity and product quality, prevention of labour accidents, the development of new industries.

VI. Find in the text word combinations with similar meaning to the following phrases.

To take interest in; a great number of efforts; to know; to make easier; to resemble a man; to include three components; the important feature; to be classified into; to operate in accordance with a fixed instruction; to have the most primitive feelings; with the purpose of taking a solution; can be thought of; to allow to eliminate a human being in tackling complex problems; to carry out various functions.

VII. Add any suitable words to the words given below to make up all possible word combinations.

1. Verb + noun	2. Adjective + noun	3. Noun + of+ noun
to create-	- society	development of-
to facilitate-	- labour	work of-
to result in-	- machine	characteristic of-
to invent-	- condition	a series of-
to process	- system	speed of –
to carry out-	- engineering	magnitude of-
to possess -	- programme	elements of –
to exclude -	- movement	a variety of –
to produce -	- experience	use of –
	- laboratory	a number of

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

1.One of the first true robots was an invention made by James Watt.

2.The essential characteristic of a robot is that it can be programmed to carry out and repeat a series of operations.

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

4. Numerous attempts to create devices facilitating life resulted in the development of robots.

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

6. A robot is a man-made machine that does the work of a human being and looks like him.

7. The use of robots has produced a number of economic and social advantages.

8. The word “robot” was coined by a Czech playwright Karel Capek by parodying the word “robota” meaning slave labour.

9. Robots serve mankind in thousands of ways and can operate practically anywhere.

10. The intellectual robots can be considered as the machines possessing elements of artificial intellect.

IX Answer the questions.

a. What is a robot?
b. Why did man begin to create robots?
c. What is the origin of the word “robot”?
d. When did true robots become possible?
e. What generations are automatic industrial manipulators divided into?
f. What are the essential characteristics of each generation?
g. What spheres can robots be applied?
h. What advantages does their use provide?

X Make a presentation of a robot of your own design. What features would you like it to possess? What purposes are you going to use your robot for?

XI Speak about robots, their importance in human life, spheres of their application today and in future.

XII Read the text. Be ready to speak in detail on the apparatus described in the text. Try to guess meaning of unknown words from the context.

Built from Parallax, Inc.’s Robotics Kit, the BOEBot is an educational prototype. Constructing the robot helps to both explain and demonstrate the fundamental principles of robotics. The completed robot is barely the size of a VHS cassette and weighs in at two pounds. The BOEBot moves about on a three-wheel system. Two wheels are plastic discs attached directly to servos. A small plastic ball serves as a non-powered tail wheel.

The BOEBot Package. The “BOE” in BOEBot is an acronym for Board of Education – a motherboard designed by Parallax for use with the Parallax Basic Stamp II modules have been (and still are) in use all over the world by experimenters, hobbyists, and industry. The basic Stamp II is a miniature circuit board shaped to look and act like a computer-on-a-chip. Designed to plug into a 24-pin IC socket, the BASIC Stamp II contains a PIC chip preprogrammed with a BASIC -language adapter and support circuitry.

Both the Board of Education and the basic Stamp II come with the BOEBot kit. Together, these two items can be used for a multitude of experiments set forth in Parallax Inc.’s Stamps in Class cirriculum. Stamps in Class is an excellent program developed by Parallax that offers to schools around the globe free projects (including full Basic Stamp kits) covering the various concepts of electronics.

The Robotics curriculm includes a student workbook that is divided into six chapters. Each chapter carries the reader swiftly and logically through the processes of construction and programming of the BOEBot. Every chapter ends with practical uses of robotics, quiz questions to test comprehension of the various subject matter

introduced in the text, and suggested projects that challenge the reader to embellish what they have just learned.

New concepts are introduced and explained throughout the workbook. The text successfully shows how robotics blends mechanical, electronic, and computer theories together in order to produce a somewhat intelligent machine.

Each circuit is built on the breadboard located on the Board of Education.

The various semiconductors and wires needed are included with the kit.

Every circuit is shown both as a schematic and as visual wiring diagram.

This simple learning technique helps with the interpretation of schematics, because the reader can see the schematics side by side with a representation of what the circuit actually looks like. Some examples of the circuits that are shown in the text include a piezo-driven low-battery indicator, touch sensors that are composed of a couple of resistors and metal "whiskers", and an infrared transmitter/detector for navigating.

The circuits, along with programming code, allow the BOEBot to interact with its environment. Programming is introduced on a simple scale. The reader is taken by the hand and led through each listing. Every step of every program is explained in detail.

XIII. Dwell on the subject of the text. Suggest a suitable title for the text. Add possible subtitles to express the subject of the text better.

XIV. Discuss the objectives of the described project and design peculiarities of an educational prototype.

XV. Speak on perspectives of using robots in the sphere of education.

Лабораторная работа 11

Rectifiers

I. Read and memorize the following words:

1. rectifier - выпрямитель
2. to heat - нагревать
3. impurity - примесь
4. hole - дырка
5. charge - заряд
6. polarity - полярность
7. to prevent – препятствовать, мешать

II. Read the following international words and try to guess their meaning:

electric, pneumatic, hydraulic, vacuum, electron, cathode, anode, crystal, nature, cube, atom, positive, dose, percent, material, polarity, metal.

III. Translate the derivatives define to what parts of speech they belong:

1. pure – purity – impurity
2. call – called – calling
3. effect – effective – effectively
4. combine – combination – recombine
5. oppose – opposition – opposite
6. attach – attached – attachment

IV. Match up the antonyms:

a) to heat, purity, positive, to prevent

b) to promote, negative, to cool, impurity

Text A
Rectifiers

A rectifier is an electric check valve. A check valve is a pneumatic or hydraulic device allowing only one-way flow. One-way flow is the key.

An early vacuum tube rectifier was called a Fleming Valve. Electrons would flow from a cathode to an anode but not the other way because the cathode was heated and the anode was not. Vacuum tubes are still called valves in the United Kingdom.

Today's rectifiers are almost all solid-state based on the PN junction. A PN junction is made of a single crystal (usually silicon) with impurities called "dopants" that change the nature of charge flow in the dopant area. If you put a voltage across a cube of pure silicon, half the current will flow in the form of electrons free of atoms, and half will flow in the form of holes (places where the crystal "thinks" an electron should be). The holes are effectively positive charges. So, if you dose one half the cube with "donor" dopant, 99.9% percent of charge flow becomes electrons, and the material is now called "N". The other half can be dosed with "acceptor" dopant, and 99.9% of charge flow becomes holes and the material is called "P". The border is called a PN junction.

A PN junction rectifies because only voltage polarity that pushes holes and electrons toward the junction causes current flow. The holes and electrons "recombine" at the junction. The opposite polarity pulling holes and electrons away from the junction, prevents current flow because when the holes come to the attached wire they cannot go further. Metal does not allow "hole flow".

V. Give English equivalents of the following phrases and words:
электровакуумная лампа; а не наоборот; твердотельный; PN переход; легирующая примесь; чистый кремний; дозировать; граница.

VI. Agree or disagree with the following statements. Use the phrases below:
I'm afraid that's wrong;
you are quite right;
you are not quite right;
that's not quite so;
I think you are mistaken;
as far as I know;
according to the text.
1. A rectifier is an electronic check valve.
2. Vacuum tubes are still called valves in the United Kingdom.
3. Today's rectifiers are all solid –based on the PN junction.
4. The holes are positive charges.
5. The border is called a PN junction.

VII. Fill in the gaps using the information from the text.
1. A rectifier is … valve.
2. An early vacuum tube rectifier was called a … valve.
3. Electrons would flow from a cathode to an anode but … way.
4. Today's rectifiers are almost all ….
5. A PN junction is made of … with impurities called ….
6. … are effectively positive charges.
7. The holes and electrons … at the junction.
8. Metal does not allow ….

Text B

I. Read the text:

What is a rectifier and what does it do?

I posted 2 days ago about my tach and volt guage going crazy. One guy said it was probably my rectifier going out. Well, I guess it went ahead and went out. I lost all power this morning to my motor and had to be towed in. Everything went out but troll motor (seperate battery). Bilge, radio, depth finder, aereator, trim, etc, etc, etc all went out. Needless to say the outboard wouldnt crank. What is a rectifier and what exactly does it do? Any explanations on what happened? I'll check back in a few

minutes. I'll be outside getting all my fishing stuff out in preparation of taking my rig to the shop. My motor is a 1994 90hp Mariner. Thanks!

II. Answer the questions:
1. What is the source the text was taken from? Explain your answer.
2. What is the problem described in the message?

III. Read these messages and choose the most suitable one for the above mentioned problem. Explain your choice.

(1) 10/30/99 4:08:00 PM Submitted by JohnJ (205.188.199.162) from ARKANSAS says rectifier

The rectifier would not shut down all components you described. What a rectifir does is convert the alternating current produced by your alternator to direct current by running the current through its positive and negative diodes. Since an alternator must be energized by current before it will work, the alternator and/or rectifier won't come into play if all accessories have shut down. This sounds more like a tripped breaker, blown fuse to the dash accessories (including key) or a bad ground. The voltmeter and other accessories bouncing sound like a bad ground connection. Check all connection before going to shop. Good luck, John

(2) 10/30/99 4:13:00 PM Submitted by k jones (209.124.193.244) from LOUISIANA says bad rectifers your rectifirs charge your starting battery, make your tack work also. look to see if you can see oil are some kind of fluid leaking from them, this is a for sure sign they are gone your starting battery sounds totally dead these arn't hard to change get a shop manual and change them your self, this will save you about an hour's worth of labor at the dealer good luck k jones. they are small black modules by your power packs, yours may be gray being a mariner.

(3) 10/30/99 5:15:00 PM Submitted by Spotted Bass (55.30.254.174) from MISSISSIPPI says I'm a DumbAss

Got to looking at my battery and connections. My cables on my ignition battery looked fine upon casual inspection. However after digging on them with my fingernail, I rediscovered/remembered that they are copper. They looked silver. So I scraped them down to the copper real good, re-connected and viola.....back in business just in time for tomorrows fishing. I havent put it back in the water yet to see if that was what was making my tach and volt guage go nuts, but I suspect that it was. Thanks guys for the responses and may you catch a big old lunker tommorrow.

(4) 10/30/99 8:20:00 PM Submitted by shipwrek (216.168.96.25) from ALABAMA says rectifiers the 90hp mariner has a stator, rectifier, and a battery, the stator includes the charge for the ingnition and the lighting coil, which produce AC voltatage the 2 yellow wires go to your rectifier/regulator which change the ac voltage to DC through diodes, this has two yellows, one gray, one or two reds., yellows are input to the rectifier, gray is your tach signal(AC) the male red is the sense wire to see if the battery needs a charge, the red female is the DC output to the battery, oh ya black thats ground of course., this must be checked with a multimeter for voltage output with a full load on the battery.. approxl3.75v and if you have a amp meter its good to check the amp output also also.sorry get a book for proper test procedure.,

check to see if you have a black stator if you do you may want to save some $$$$$ for it because it will be failing soon if you continue to have battery problems...look under the cowl for your emergency pull cord, the motor will always start even if you have a bad battery, unless you have no spark of course, now thats a mouth full...good luck!!!

(5) 10/30/99 10:11:00 PM Submitted by McCoy (152.163.204.21) from TENNESSEE says Rectifier

Loose battery cables can burn out your rectifier. Changing batteries while the motor is running can burn one out. I learned that the hard way. When my rectifier/regulator went out, the tach would work when the motor was running under 1000 RPMs but would quit at higher speeds and the battery would not change.

IV. Choose the words you want to remember, but not the ones that aren't worth remembering.

V. Make sentences of your own with these words.

VI. Write your own message in reply.

Лабораторная работа 12

Transistors and semiconductors

I. Read and memorize the following words:

1. energy –band gap – запрещенная зона; ширина запрещенной зоны
2. elemental semiconductor – простой полупроводник
3. compound –смесь; соединение

compound semiconductor – сложный полупроводник

4. intrinsic semiconductor – собственный полупроводник
5. extrinsic semiconductor – примесный полупроводник
6. to visualize – мысленно представлять себе; делать видимым, зримым, ощутимым
7. to bind (bound) – связывать, скреплять
8. lattice – кристаллическая решетка
9. adjacent – примыкающий, смежный, соседний
10. conduction band – зона проводимости,
    valence band – валентная зона
11. to excite – возбуждать
12. doping – легирование, введение примеси
13. resistivity – удельное сопротивление
14. impurity – примесь
15. ruggedness – прочность, устойчивость
16. radiant – излучающий; лучистый
17. push-pull amplifier – двухтактный усилитель
18. matching transformer – согласующий трансформатор

II. Analyse the following derivatives and find their roots. Give more examples of similar word formation.

Semiconductor, classified, easily, direction, essentially, concentration, revolutionize, ruggedness, small – dimensioned, reliability

III. Make sure that you know the words below. What parts of speech do they belong to and what derivatives can they form?

Conduct, flow, charge, fill, capable, exhibit, pure, modify, gain, design, consume, transform, oscillate, provide, amplify, supply

IV. Match up

1. the synonyms

a) advance, to increase, to contain, motion, to arise from, perfect, to participate, property, fabrication, important

b) movement, indispensable, achievement, to result from, to enlarge, ideal, to comprise, to take part, manufacture, feature

2. the antonyms

a) elemental, ability, intrinsic, to bind, solid, opposite, possible, vacant, bulky, mobile

b) inability, liquid, compound, similar, extrinsic, impossible, still, to disconnect, compact, occupied

V. Look through the following terms and make sure that you remember them. Try to explain the terms and use them in your own sentences and situations:

conductor, semiconductor, insulator, charge carrier, positive charge carrier, negative charge carrier, electrical conduction, vacuum tube, transistor, amplification, current gain, lifetime, reliability, photocell, light source, low-impedance load, low-voltage device, communications system, noise performance, transmitter.

VI. Read and translate the text.

Transistors and Semiconductors

One of the important advances in the development of electronics is the invention of semiconductor materials, a form of matter situated between metals and insulators in their ability to conduct electricity.

The semiconductor is an electric conductor with resistivity in the range between metals and insulators, in which the electric charge – carrier concentration increases with the increasing temperature range. Semiconductors are usually materials which have energy – band gaps smaller than 2 e V. Semiconductors can be crystalline or amorphous and are classified as elemental and compound, intrinsic and extrinsic semiconductors.

Elemental semiconductors are single-element semiconductor materials such as silicon or germanium. Compound semiconductors are materials containing more that one element, for example, III-V compounds such as gallium, arsenide, aluminium, arsenide, cadmium sulfide and copper oxide.

Unlike the vacuum tube where current flow arises from the motion of charge carriers within a vacuum, semiconductor devices develop current flow from the motion of charge carriers within a crystalline solid. The conduction process in semiconductors is most easily visualized in terms of silicon and germanium which are by far the most widely used semiconducting materials. The atoms of each of these elements have four electrons in the outer shell (valence shell). These electrons are normally bound in the crystalline lattice structure. Some of these valence electrons are free at room temperature, and hence can move through the crystal; the higher the temperature; the more electrons are free to move. Each vacancy, or hole, left in the lattice can be filled by an adjacent valence electron. Since a hole moves in a direction opposite to that of an electron, a hole may be considered as a positive-charge carrier.

Electrical conduction is possible by the motion of electrons or holes. A perfect semiconductor is essentially an insulator at absolute zero temperature, since its conduction band is vacant. As the temperature increases electrons are thermally excited from the valence into the conduction band and the conductivity increases. The

free electrons in the conduction band and the holes in the valence band participate in electrical conduction.

The electrons are negative charge carriers, while the holes are positive carriers.

An important property of semiconductors is the ability to change their resistivity over several orders of magnitude by doping. Semiconductors with a low impurity concentration having electrical properties of the pure semiconductor material are called intrinsic semiconductors. Intrinsic semiconductors exhibit a negative coefficient of resistivity, since the number of carriers increases with temperature. Semiconductors with electrical properties modified by impurities are called extrinsic semiconductors. Semiconductor materials are widely used in the fabrication of transistors and diodes.

A transistor is an active semiconductor device with three or more electrodes. It is called active since the transistor is capable of amplification and current, voltage and power gain. A transistor is an electron device in which electronic conduction takes place within a semiconductor.

Transistors revolutionized radioengineering and electronics replacing bulky vacuum tubes and becoming indispensable in many applications. Having small size, great mechanical ruggedness, long lifetime and high reliability, transistors make it possible to design compact, small-dimensioned electronic devices which consume very little power and to produce devices which cannot be made with vacuum tubes.

The transistors are used for direct transformation of heat energy into electrical energy by means of thermal elements. They are also used to transform radiant energy into electricity with the help of photocells or so called solar batteries. In later years light sources and lasers were built on the basis of transistors.

The range of transistor applications is very wide. Transistors are used in class B push-pull amplifiers for high-power linear applications. Since the transistor is a low-voltage device, low-impedance loads such as speakers and servomotors can be driven without a matching transformer.

High-frequency applications of transistors include amplifiers, oscillators and mixers in communications system. They provide useful power gains with noise performance superior to that of vacuum tubes. High-frequency transistors used in mobile transmitters can supply 50W at 500 MHz.

VII. Find in the text the English equivalents of the following phrases

Способность проводить электричество; концентрация носителей электрического заряда; кристаллические и аморфные полупроводники; полупроводниковые материалы, состоящие из одного элемента; соединения элементов III-V групп; движение носителей заряда внутри кристаллического твердого тела; с точки зрения кремния и германия; структура кристаллической решетки; соседний валентный электрон; принимать участие в электро-проводности; способность изменять удельное сопротивление посредством легирования; низкая концентрация примеси; электрические свойства, изменяемые примесями; усиление по току, напряжению и мощности; незаменимые во многих сферах применения; конструировать компактные, малогабаритные электронные устройства; непосредственное преобразование тепловой энергии в электрическую энергию; шумовая характеристика, превосходящая характеристику электровакуумных ламп.

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

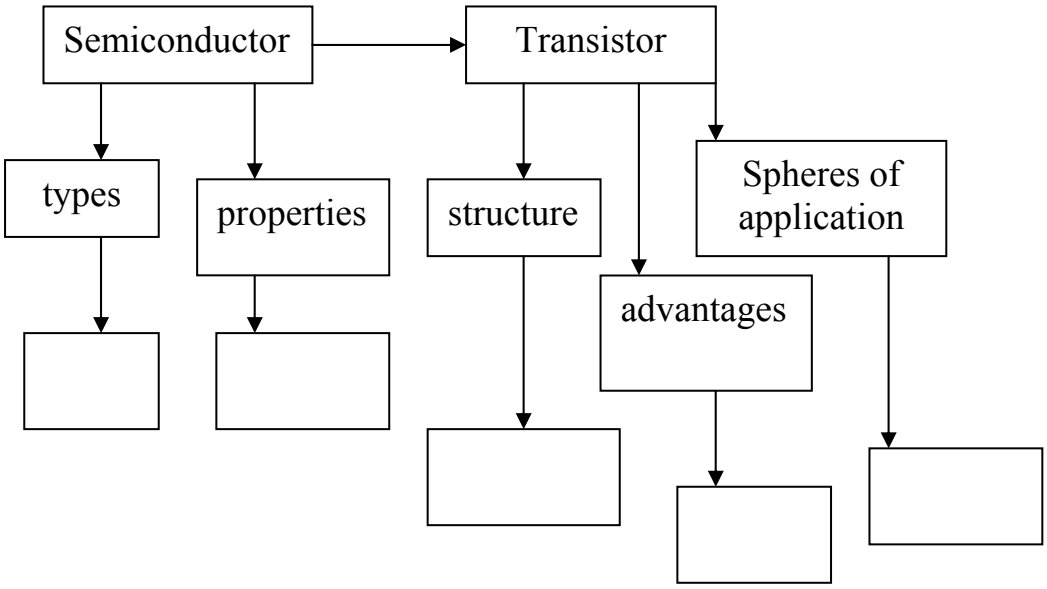
1. The invention of semiconductor materials has negligible importance for the development of electronics.
2. Electronical conduction of the semiconductor increases with the increasing temperature range.
3. Semiconductor materials exit only in one form.
4. Current flow in semiconductor devices results from the motion of charge carriers within a crystalline solid unlike the vacuum tube where current flow depends on the motion of charge carriers within a vacuum.
5. Electrical conduction is possible by the motion of electronics or holes. The electrons are negative charge carriers while the holes are positive ones.
6. Electrical properties of semiconductors can't be modified by impurities.
7. Transistors revolutionized radioengineering and become indispensable in many applications.
8. The range of transistor applications is not wide.

IX. Explain what property determines the classification of materials into conductors, semiconductors and insulations.

X. Dwell on types of semiconductors and their properties.

XI. Describe the mechanism of electrical conduction and its possible forms.

XII. Complete the following diagram to present the important characteristics of semiconductors and transistors.



XIII. Speak on semiconductors and transistors, their characteristics, spheres of application and perspectives.

XIV. Read the text and say what is the subject of the text?

The point-contact transistor[1] was invented in 1948 by John Bardeen and Walter H. Brattain, members of a team at Bell Telephone Laboratories working under the direction of William Shockley. “Invented” may not be the right word: “discovered” may be more correct, and Shockley himself has used the words “creative failure” in connection with the work that led to the device.

The work at Bell Telephone laboratories immediately after World War II was directed towards producing a solid-state amplifier using semiconductor materials. Shockley had predicted from theoretical work that the resistance of a piece of semiconductor material should change when it was subjected to an electric field normal to the current flow. Experiments, however, did not confirm[2] this. The prediction was, in fact, true but it was not until 1963 that it was verified[3] by the invention of the insulated-gate field-effect transistor[4]. The failure to observe the expected change in resistance was ascribed[5] by Bardeen in 1947 to some surface states[6] neutralising the effect of the applied electric field. Further experiments were devised to investigate the surface states of a semiconductor material.

Perhaps the most important function of the point-contact transistor was its demonstration that a practical amplifying device could be made using the flow of charges through a semiconductor material. It provided a verification of the theoretical work on solid-state physics that had preceded[7] it. Much of the material technology that was to be further developed over the next two decades to enable the many new-types of solid-state devices to be manufactured was developed from work done for the point-contact transistor on the purification of germanium, the growing of single crystals, doping, and preparing small slices of semiconductor material. In many different ways, the point-contact transistor prepared the way for the success of the junction transistor[8]. The junction transistor was invented by William Shockley of Bell Telephone laboratories in 1949. The original transistor consisted of a piece of a single crystal of germanium containing two n-type regions separated by a p-type region. The two n-type regions were called the base. The two pn junctions were biased[9] in the same way as the emitter and collector wires in the point contact transistor had been.

Today the most widely used technique for transistor fabrication is the diffusion process. Without the development of this technique of junction formation, the rapid growth made in all fields of transistor electronics would have been impossible.

The alloy technique preceded the development of the diffusion process. Alloy transistors[10] were among the first types manufactured and are still used, because the process is inexpensive and performance of the devices is good at low frequencies.

The diffusion process has many advantages over the alloy process, i.e., precise[11] control of junction areas and layer width, nonuniform-resistivity regions to provide for a variety of electrical characteristics, a variety of geometries to optimize current handling[12] and frequency response.[13] There are many variations of this process, but it basically involves exposing a semiconductor wafer[14] of predetermined resistivity to a gaseous flow of impurities in a furnace[15]. The gaseous impurity atoms thus diffuse into the semiconductor surface, forming a pn junction.

A modification in the diffusion process which led to the development of integrated circuits, large-scale integration and other advanced technologies in

semiconductor devices is the planar process[16]. The term planar refers to a device in which each of the junctions, emitter-base and collector-base, is brought to a common plane surface.

The significance of the planar process is that the pn junctions are terminated[17] and protected beneath a silicon oxide layer. Thus many of the surface problems associated with other types of transistor fabrication techniques, i.e., high leakage currents and poor low-current dc gain, are eliminated.

To improve switching speed, operating frequency, dc characteristics, collector voltage ratings, power dissipation, and reliability, the epitaxial collector was introduced to the planar transistor devices. The epitaxial process provides a means of growing a very thin high-purity single crystal layer of semiconductor material on a very heavily doped crystal wafer of the same type.

The topography and geometry of transistors take many shapes. In power transistors the geometry is chosen to favor current-handling capability, whereas in small-signal transistors, high-speed operation is the design goal.

Notes to the text

1. point-contract transistor – точечный транзистор
2. to confirm – подтверждать
3. to verify – проверять; подтверждать, устанавливать истинность
4. insulated-gate field-effect transistor – полевой транзистор с изолированным затвором
5. to ascribe – приписывать; относить за счет чего-либо
6. surface state – поверхностное состояние
7. to precede – предшествовать
8. junction transistor – плоскостной транзистор
9. to bias – смещать, отклонять
10. alloy transistor – сплавной транзистор
11. precise – точный
12. current handling – управление током
13. frequency response – амплитудно-частотная характеристика
14. semiconductor wafer – полупроводниковая пластина
15. furnace – печь
16. planar process – планарная технология
17. to terminate – завершаться, оканчиваться; ограничивать

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

"creative failure"; a solid-state amplifier; to be subjected to an electric field; to investigate the surface states of a semiconductor material; a practical amplifying device; the growing of single crystals; two n-type regions separated by a p-type region; the diffusion process; exposing a semiconductor wafer of predetermined resistivity; a common plane surface; the epitaxial process; to take many shapes.

XVI. Find in the text words with similar meaning to the following words.

Under the guidance; to forecast; to be exposed; to justify; to be proved; to watch; to attribute; to work out; to research; show; to give; to forerun; to allow; to be produced; to comprise; manufacture; cheap; characteristics; accurate; breadth; importance; connected with; to be excluded; to be built in; form; objective.

XVII. Suggest a suitable title for the text.

XVIII. Divide the text into logical parts, entitle them and write an outline of the text.

XIX. Speak on the invention of a transistor and modern techniques of transistor fabrication.

XX. Read the text and speak on the types of impurities.

Impurities can be added to semiconductors to modify their electrical properties. This addition is termed doping. Silicon doped with pentavalent substitutional impurities[1] such as phosphorus, arsenic, and antimony will have a higher electron density due to the easily ionized fifth electrons of the impurities. The hole concentration in such a silicon crystal is reduced since the np product remains constant. Dopants[2] which increase the electron density are called donors[3]. Dopant concentration is denoted N_p.

The addition of trivalent dopants such as boron, gallium, and indium to silicon will attract electrons and reduce the electron density. Again, since the np product remains constant, the hole density must increase. Dopants which reduce the electron density are called acceptors[4]. Acceptor concentration is denoted N_a.

In an extrinsic (doped) semiconductor the current-carrier type introduced by doping predominates. Donor-doped material is called n-type because the majority of carriers are electrons. The electrons in such semiconductors are the majority carriers, while the holes are the majority carriers. Acceptor-doped materials are called p-type. Here the holes are the majority[5] carriers and electrons are the minority carriers.

Resistivity is determined by the concentration of majority carriers.

Lifetime is the average time required for excess minority carriers to recombine with majority carriers. Recombination occurs at “traps” caused by impurities and imperfections in the semiconductor crystal. Semiconductor junctions are formed in material grown as a single continuous crystal to obtain the lattice perfection required, and extreme precautions are taken to ensure exclusion of unwanted impurities during processing. However, in some applications short lifetime is desired, and in such cases gold doping is used to achieve this.

Carrier mobility is the property of a charge carrier which determines its velocity in an electric field. Mobility also determines the velocity of a minority carrier in the diffusion process. High mobility yields a short transit time and good frequency response.

Notes to the text

1.substitutional impurities – примесь замещения
2.dopant – легирующая примесь
3.donor – донор, донорная примесь
4.acceptor – акцептор, акцепторная примесь
5.majority carrier – основной носитель заряда
6.minority carrier – неосновной носитель заряда

XXI. Explain the purpose of doping.

XXII. Discuss the difference between donor-doped materials and acceptor-doped materials.

XXIII. Explain the terms lifetime and carrier mobility.

Лабораторная работа 13

Amplifiers

I. Read and memorize the following words:
1. gain - приобретать
2. d-c (d.c.) = direct current – постоянный ток
3. common - общий
4. magnitude - величина;
5. a-c (a.c.) = alternative current – переменный ток
6. capacitor - конденсатор
7. scores - десятки
8. value – величина, значение
9. in the wake of – вслед за, непосредственно за
10. corresponding - соответствующий

II. Read the following international words and try to guess their meaning:
electronic, battery, economical, type, base, collector, emitter, popular, voltage, component, pulsation, to pulsate, microamperes, milliamperes, to control.

III. Translate the derivatives define to what parts of speech they belong:
1. amplifier – amplification – to amplify – amplified
2. to operate – operation – operating
3. to conduct – conductor – conductivity – semiconductor
4. to consider – consideration – considerable
5. capacitor – capacitance – capacity

IV. Find the equivalents:

1. advantage	1. считать, рассматривать
2. capacitor	2. величина
3. value	3. преимущество
4. suppose	4. постоянный ток
5. a.c.	5. работа
6. operation	6. переменный ток
7. d.c.	7. конденсатор
8. consider	8. предполагать

Text A

Transistor Amplifier

(1) In recent years transistor amplifiers have gained wide acceptance in all branches of electronics The outstanding advantage of these circuits is that no heater voltage supply is required and that a small, low-current d-c source takes care of all transistor current needs, thus making battery operation quite economical. There are

types of semiconductor amplifiers, namely: common-base, common-collector and common-emitter amplifiers. Of these the latter is the most popular.

(2) Consider the operation of such an amplifier. First, let us suppose that there is no input signal. Direct current I is flowing in the base circuit, while direct current II is in the collector. The collector voltage II is of a constant magnitude. The alternating input voltage appearing, its variable component induces pulsation of the base current. The changing base current in its turn makes the collector current pulsate. This induces corresponding pulsations of the collector voltage, which come to the current output via capacitor.

(3) In case a low-voltage transistor is used in the circuit, the alternating base current will be in the order of scores of microamperes, while the alternating collector current will be in the order of milliamperes. Thus a low input current controls a high output current, amplifying the input signal.

(4) Thus, in the absence of the input signal the transistor base and collector carry direct currents, their value being determined by the resistance offered by the circuits. Once, the input signal is applied, the base current starts to change in the wake of the input signal, producing corresponding changes in the collector voltage and current.

I. Переведите словосочетания:

absolute value, peak value, power value, working value, optimum value; shunting capacitor, disk capacitor, vacuum capacitor, variable capacitor; radio-frequency operation, broadband operation, unstable operation.

II. Сгруппируйте данные слова по смыслу:

1. stable	1. advantage
2. main	2. current
3. important	3. operation
4. variable	4. capacitor
5. alternating	5. value

III. Закончите предложения:

1. The outstanding … of transistor amplifiers is that no heater voltage supply is required. 2. Battery … of transistor amplifier is quite economical. 3. Pulsations of the collector voltage come to the circuit output via … .4. In the absence of the input signal the … of the transistor base and collector currents are determined by the resistance offered by the circuits.

---

1. values; 2. capacitor; 3. operation; 4. advantage.

IV. Опровергните высказывания:

1. There is only one type of semiconductor amplifiers. 2. In this text the operation of common-base amplifier is considered. 3. A low input current in the amplifier controls a low output current.

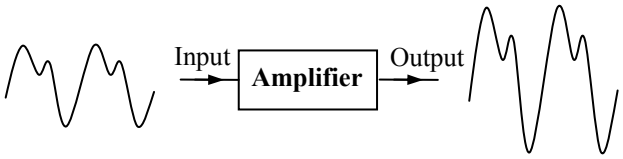
Text B

Types of Amplifier Distortion

I. Read and memorize the following words:
1. frequency - частота;
2. to avoid - избегать;
3. linearity - линейность;
4. distortion - искажение;
5. range - диапазон;
6. to satisfy the requirements – удовлетворять требованиям;
7. occur – происходить, иметь место, случаться;
8. to clip - ограничивать;
9. feedback – обратная связь;
10. to cause – вызывать, стать причиной.

Types of Amplifier Distortions

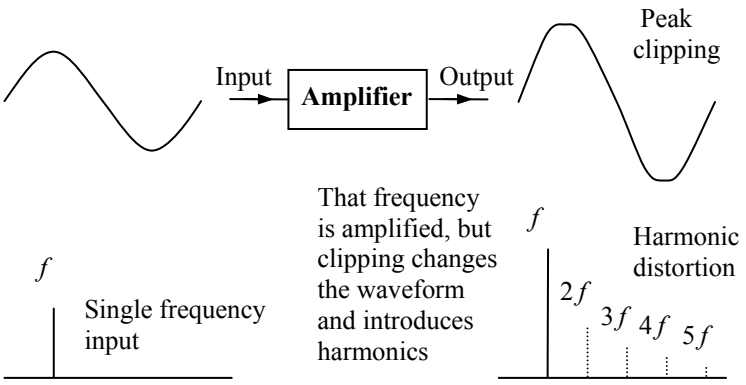
The task of an audio amplifier is to take a small signal and make it bigger without making any other changes in it. This is a demanding task, because a musical sound



usually contains several frequencies, all of which must be amplified by the same factor to avoid changing the waveform and hence the quality of the sound. An amplifier which amplifies all frequencies and amplitudes by the same factor is said to be linear. Departures from linearity lead to various types of distortions.

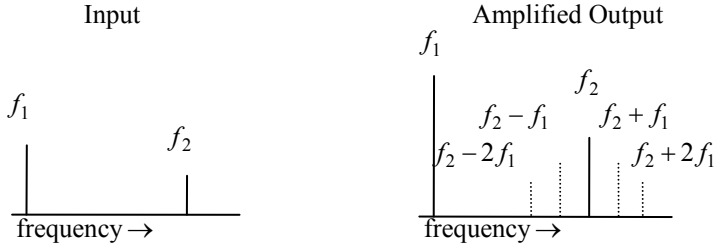
Amplifier Distortion.

All frequencies and all amplitudes within an amplifier's operating range must be amplified by the same factor to avoid distortion. An amplifier which satisfies this requirement is said to be perfectly linear. If the peaks of the waveform arc clipped, this gives rise to what is called harmonic distortion. Another type of distortion is intermodulation distortion, which occurs when different frequencies in the signal mix to produce sum and difference frequencies which didn't exist in the signal. Transient distortion occurs when amplifier components cannot handle the rate of change of the signal, for example in rapid percussive attacks. There is also transient intermodulation distortion (TIM) to which modern integrated circuits are susceptible. Such circuits depend upon feedback for their linearity, but time delays in the feedback can cause intermodulation distortion on fast transients in the signal.



Harmonic Distortion. A common type of amplifier distortion is called harmonic distortion. It can arise if any component in the amplifier clips the peaks of the waveform. A common specification for high fidelity amplifiers is the total harmonic distortion. This distortion may be less than 1%. or even less than 0.5% from 20-20,000 Hz for high quality amplifiers.

Intermodulation Distortion. Non-linearity in amplifier components causes mixing of frequency components to form components at sum and difference frequencies. This intermodulation distortion is particularly troublesome in the reproduction of music because it generates frequencies which were not present in the original music and are thus very noticeable. Harmonic distortion may also be serious, but at least the musical sound probably already had these harmonics present as part of the harmonic content of the sound, so it can be tolerated to a greater degree than intermodulation distortion.



II. Match the terms in the box with the appropriate definition:

a) cause; b) avoid;	c) feedback; d) range;	e) frequency.

1. The limits within which something operates, exists or is effective.
2. Uncontrolled noise from an electrical amplification.
3. To keep away from.
4. To lead to.
5. A particular member of radio waves per second at which a radio signal is broadcast.

III. Characterize each type of distortion.

Text C

Emtron Amplifiers

I. Translate this text for 30 minutes.

(1) All Emtron amplifiers have been developed with a specific application in mind, and they all have one thing in common - the unique modular construction! All modules except where the power is concerned are interchangeable, irregardless of the model of the amplifier. The advantages of such a construction are enormous - not only from a service point of view, where a few minutes and a screwdriver is all you need. Modular construction also has a big advantage in manufacturing. These "new breed" high quality linear amplifiers are quite unique. Designed and built in Australia by professional engineers, who also happen to be amateur radio operators. At Emtron we sincerely believe that there is no other manually tuned amplifier on the market today that meets the craftsmanship, modern electronic engineering techniques, reliability and features of EMTRON amplifiers.

(2) All Emtron amplifiers have very sophisticated tube protection circuitry, which protects the tube from all possible mishandling. Emtron does not only build amplifiers for amateur service, we also supply custom-built amplifiers for different applications such as professional applications, paramilitary, RF power generators (plasma, industrial and medical applications) as well as broadcasting.

II. Find more information about different types of amplifiers. Be ready to speak about one of them.

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