

**КАЗАНСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ**

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# **HISTORY OF COMPUTERS. RELOAD.**

Учебное пособие

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Данное учебное пособие представляет собой сборник оригинальных текстов по истории возникновения и развития компьютерных технологий. Пособие отвечает программным требованиям и рассчитано на студентов ИВМиИТ и ИТИС уровней Pre-Intermediate и Intermediate с целью развития навыков чтения, монологической речи, ведения дискуссии и активизации лексики по специальности. Пособие снабжено иллюстрациями, дающими представление о вычислительных устройствах и их изобретателях. Тексты из данного пособия могут быть также использованы в качестве заданий для самостоятельной работы, при проведении зачетов или контрольных точек. Учебное пособие предназначено для студентов вузов, аспирантов и преподавателей.

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## Введение

Данное учебное пособие предназначено для занятий со студентами 1 и 2 курсов Высшей школы информационных технологий и информационных систем (ВШ ИТИС) и Института вычислительной математики и информационных технологий (ИВМиИТ) Казанского (Приволжского) федерального университета с уровнем владения языком А2, В1.

Пособие состоит из 6 частей (модулей), каждая из которых соответствует одному из поколений компьютеров. Внутри каждого модуля материал разбит на несколько юнитов. Каждый юнит включает в себя оригинальные тексты по истории возникновения и развития компьютерных технологий с разработанными к ним до- и послетекстовыми заданиями. При отборе текстов учитывались их познавательная ценность и тематическое соответствие. Юнит построен так, чтобы были представлены различные виды упражнений: вопросно-ответная работа, упражнения на отработку лексики по специальности, словообразование, отработку монологической речи, навыков перевода, в том числе и письменного. Каждый юнит завершается творческими заданиями, направленными на актуализацию полученных знаний. Эти задания представлены в виде презентаций, обсуждений, комментариев к тем или иным утверждениям.

Пособие содержит цветные иллюстрации к текстам, из которых можно получить представление о вычислительных устройствах и их изобретателях. Кроме того, пособие включает входной и выходной тесты, сделанные в виде викторины (Quiz).

Цели данного пособия – развить у студентов навыки работы со специализированными текстами, ведения дискуссии и активизации лексики по специальности.

Материалы пособия прошли апробацию в студенческих группах и могут быть использованы как для аудиторной, так и для самостоятельной работы.

## **Introductory module.**

### **Generations of Computers**

#### **Zero Generation Computers**

The first man to create a calculating machine was the French scientist Blaise Pascal (1623-1662). He built this device called Pascaline when he was only 19 years old. It was entirely mechanic, the operations it supported were only addition and subtraction.

Thirty years later German mathematician Gottfried Wilhelm von Leibniz designed a calculating machine called the Step Reckoner.

For 150 years there wasn't much progress in calculating machine design, until mathematician Charles Babbage (1792-1871) constructed his difference engine which had only two operations just like the Blaise Pascal's machine. Because the difference engine calculated only one algorithm Charles got bored with it and decided to make another machine which was the analytical engine which had multiplication and division too. The advantage of this engine was that it could do many different algorithms. Babbage is considered as "father of the computer".

Next in the series mechanic computers were the machines designed by Konrad Zuse, John Atanasoff and George Stibbitz. Especially interesting was the Atanasoff machine which used binary arithmetic and had memory capacitors similar to the DRAM chips.

Last in the series zero generation computers were Mark I and Mark II machines.

<https://justsciencestuff.wordpress.com/2013/09/08/67/>

***Cover the text and answer the following questions:***

- 1) What did all the above mentioned devices have in common?
- 2) Which countries were zero generation computers invented in?
- 3) Can you list the zero generation computers names described in this text?

## **First Generation (1945-1956)**

During the period of 1940 to 1956 first generation of computers were developed. The first generation computers used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. The vacuum tube was developed by Lee DeForest. A vacuum tube is a device generally used to amplify a signal by controlling the movement of electrons in an evacuated space. First generation computers were very expensive to operate and in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions.

### **CHARACTERISTICS**

- 1) First generation computers were based on vacuum tubes.
- 2) The operating systems of the first generation computers were very slow.
- 3) They were very large in size.
- 4) Production of the heat was in large amount in first generation computers.
- 5) Machine language was used for programming.
- 6) First generation computers were unreliable.
- 7) They were difficult to program and use.

<http://latesttechnomanias.blogspot.ru/2010/06/first-generation-computer.html>

***Cover the text and answer the following questions:***

- 1) What was the period of first generation computers?
- 2) Who invented the vacuum tube?
- 3) What kind of device is the vacuum tube?
- 4) What can you say about the size of these computers?
- 5) What other disadvantages did they have?

## **Second Generation Computers (1956-1963)**

During the period of 1956 to 1963 second generation of computers were developed. The second generation computers emerged with development of Transistors. The transistor was invented in 1947 by three scientists J. Bardeen, H.W. Brattain and W. Shockley. A transistor is a small device made up of semiconductor material like germanium and silicon. Even though the Transistor were developed in 1947 but was not widely used until the end of 50s. The transistor made the second generation computers faster, smaller, cheaper, more energy-efficient and more reliable than their first-generation computers. Even though the transistor used in the computer generated enormous amount of heat which ultimately would lead to the damage of the computers but was far better than vacuum tubes.

Second generation computers used the low level language i.e. machine level language and assembly language which made the programmers easier to specify the instructions. Later on High level language programming were introduced such as COBOL and FORTRAN. Magnetic core was used as primary storage. Second generation computer has faster input /output devices which thus brought improvement in the computer.

### **CHARACTERISTICS**

- 1) Transistors were used in place of vacuum tubes.
- 2) Second generation computers were smaller in comparison with the first generation computers.
- 3) They were faster in comparison with the first generation computers.
- 4) They generated less heat and were less prone to failure.
- 5) They took comparatively less computational time.
- 6) Assembly language was used for programming.
- 7) Second generation computers has faster input/output devices.

IBM 7000, NCR 304, IBM 650, IBM 1401, ATLAS and Mark III are the examples of second generation computers.

<http://latesttechnomanias.blogspot.ru/2010/06/second-generation-computers.html>

***Cover the text and answer the following questions:***

- 1) What was the period of second generation computers?
- 2) What invention were they based upon?
- 3) What advantages did second generation computers have due to transistors?
- 4) Which programming languages did second generation computers use?

### **Third Generation Computers (1964-1971)**

During the period of 1964 to 1971 Third generation computers were developed. The third generation computers emerged with the development of IC (Integrated Circuits). The invention of the IC was the greatest achievement done in the period of third generation of computers. IC was invented by Robert Noyce and Jack Kilby in 1958-59. IC is a single component containing a number of transistors. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. Keyboards and monitors developed during the period of third generation of computers. The third generation computers interfaced with an operating system, which allowed the device to run many different applications at one time with a central program that monitored the memory.

### **CHARACTERISTICS**

- 1) IC was used instead of transistors in the third generation computers.



- 2) Third generation computers were smaller in size and cheaper as compared to the second generation computers.
- 3) They were fast and more reliable.
- 4) High level language was developed.
- 5) Magnetic core and solid states as main storage.
- 6) They were able to reduce computational time and had low maintenance cost.
- 7) Input/Output devices became more sophisticated.

PDP-8, PDP-11, ICL 2900, IBM 360 and IBM 370 are the examples of third generation computers.

<http://latesttechnomanias.blogspot.ru/2010/06/third-generation-computers.html>

***Cover the text and answer the following questions:***

- 1) What was the period of third generation computers?
- 2) What invention were they based upon?
- 3) What is the definition of the IC?
- 4) What advantages did they have compared to the second generation computers?
- 5) What kind of programming languages did third generation computers use?

### **Fourth Generation Computers (1971-Present)**

After 1971 the fourth generation computers were built. The fourth generation computers were the extension of third generation technology. The fourth generation computers emerged with development of the VLSI (Very Large Scale Integration). With the help of VLSI technology microprocessor came into existence. The computers were designed by using microprocessor, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. The fourth generation computers became more powerful, compact, reliable and

affordable. As a result, they give rise to personal computer (PC) revolution. For the first time in 1981 IBM introduced its computer for the home user and in 1984 Apple introduced the Macintosh Microprocessor.

### **CHARACTERISTICS**

- 1) The fourth generation computers have microprocessor-based systems.
- 2) They are the cheapest among all the computer generation.
- 3) The speed, accuracy and reliability of the computers were improved in fourth generation computers.
- 4) Many high-level languages were developed in the fourth generation such as COBOL, FORTRAN, BASIC, PASCAL and C language.
- 5) A Further refinement of input/output devices was developed.
- 6) Networking between the systems was developed.

IBM 4341, DEC 10, STAR 1000, PUP 11 and APPLE II are the examples of fourth generation computers.

<http://latesttechnomanias.blogspot.ru/2010/06/fourth-generation-computers.html>

#### ***Cover the text and answer the following questions:***

- 1) What is the period of third generation computers?
- 2) What technology are fourth generation computers based on?
- 3) What can you say about the size of modern computers?
- 4) What about of the price of fourth generation computers?
- 5) What other positive features do they have?

#### **Fifth Generation (Present and Beyond)**

Fifth generation computers are in developmental stage which is based on the artificial intelligence. The goal of the fifth generation is to develop the device which could respond to natural language input and are capable of learning and self-organization. Quantum computation and molecular and nanotechnology will be

used in this technology. So we can say that the fifth generation computers will have the power of human intelligence.

### **CHARACTERISTICS**

- 1) The fifth generation computers will use super large scale integrated chips.
- 2) They will have artificial intelligence.
- 3) They will be able to recognize image and graphs.
- 4) Fifth generation computer aims to be able to solve highly complex problem including decision making, logical reasoning.
- 5) They will be able to use more than one CPU for faster processing speed.
- 6) Fifth generation computers are intended to work with natural language.

<http://latesttechnomanias.blogspot.ru/2010/06/fifth-generation-computers.html>

*Cover the text and answer the following questions:*

- 1) What is the goal of the fifth generation?
- 2) What technologies will be used in fifth generation computers?
- 3) What will these computers be able to do?
- 4) What programming languages will fifth generation computers use?

## ***GENERAL KNOWLEDGE QUIZ***

***Do the introductory quiz to check your general knowledge of the history of computers.***

1. This invention helped to make computers much smaller and faster. What is it called?

- A. Vacuum Tube
- B. Random Access Memory
- C. Central Processing Unit
- D. Integrated Circuit

2. This person is often called the inventor of the modern computer. He actually created the first fully electronic computer.

- A. Konrad Zuse
- B. Byron Lovelace
- C. William Gates
- D. Steve Jobs

3. This person created a machine called The Analytical Engine. His ideas were some of the first that led to the creation of computers.

- A. Simon Konrad
- B. Charles Babbage
- C. John Lovelace
- D. William Howard

4. Steve Jobs and Steve Wozniak built their first computer using a wooden box. Their company has grown and is still around today. The name of the company is:

- A. Microsoft
- B. Linux

- C. Apple
- D. Windows

5. This man is known for starting the company Microsoft back in the year 1975. Since then, he has become one of the richest people in the world. His name is:

- A. Steve Jobs
- B. Bill Gates
- C. Konrad Zuse
- D. Charles Babbage

6. This invention was 1,000 times faster than any machine built before it. It was so big that it could fill up a house.

- A. Apple I
- B. ENIAC
- C. Windows
- D. Z3

7. In 1954 scientists were able to predict exactly what computers would look like today.

- A. True
- B. False

8. Who invented the Internet?

- A. Steve Jobs
- B. More than one person
- C. Al Gore
- D. William Shockley

9. This invention replaced vacuum tubes and made computers much smaller and faster. However, it was eventually replaced by another invention.

- A. RAM
- B. ENIAC
- C. Transformer
- D. Transistor

10. This person created what is now known as the first computer program. The program was made to help the Analytical Engine calculate numbers.

- A. Charles Babbage
- B. Konrad Apple
- C. Ada Lovelace
- D. William Zuse

## MODULE 1. Zero generation computers

### Unit 1

#### Early computing machines

##### *I. Pre-reading task.*

- When and where do you think the very first computer was invented?
- Have you heard about the machine called the Pascaline? Who invented it?

##### *II. Read the text and check your answers.*

Actually speaking, the computers history did not start with electronic ones, i.e. they aren't in existence merely from early 1940's. In early days when our ancestors used to reside in cave the counting was a problem. When they started using stone to count their animals or the possession, they never knew that this day will lead to a computer of today.

The abacus, which emerged about 5,000 years ago in Asia Minor and is still in use today, may be considered the first computer. This device allows users to make computations using a system of sliding beads arranged on a rack. Early merchants used the abacus to keep trading transactions. But as the use of paper and pencil spread, particularly in Europe, the abacus lost its importance. It took nearly 12 centuries, however, for the next significant advance in computing devices to emerge



Fig. 1. The ancient abacus

In 1642, Blaise Pascal (1623-1662), the 18-year-old son of a French tax collector, invented what he called a numerical wheel calculator to help his father with his duties. This brass rectangular box, also called a Pascaline, used eight movable dials (вращающиеся зубчатые колёсики) to add sums up to eight figures long. Pascal's device used a base of ten to accomplish this. For example, as one dial moved ten notches, or one complete revolution, it moved the next dial - which represented the ten's column - one place. When the ten's dial moved one revolution, the dial representing the hundred's place moved one notch and so on. The drawback to the Pascaline, of course, was its limitation to addition.



Fig. 2. The Pascaline.

In 1694, a German mathematician and philosopher, Gottfried Wilhelm von Leibniz (1646-1716), improved the Pascaline by creating a machine that could also multiply. Like its predecessor, Leibniz's mechanical multiplier worked by a system of gears (система связанных друг с другом зубчатых колёс). Partly by studying Pascal's original notes and drawings, Leibniz was able to refine his machine.



It wasn't until 1820, however, that mechanical calculators gained widespread use. Charles Xavier Thomas de Colmar, a Frenchman, invented a machine that could perform the four basic arithmetic functions. Colmar's mechanical calculator, the arithometer, presented a more practical approach to computing because it could add, subtract, multiply and divide. With its enhanced versatility, the arithometer was widely used up until the First World War.

The real beginnings of computers as we know them today, however, lay with an English mathematics professor, Charles Babbage (1791-1871). Babbage's first attempt at a mechanical computing device, the Difference Engine, was a special-purpose machine designed to tabulate logarithms and trigonometric functions by evaluating finite differences to create approximating polynomials. Construction of this machine was never completed; Babbage had conflicts with his chief engineer, Joseph Clement, and ultimately the British government withdrew its funding for the project.

During this project, he realized that a much more general design, the Analytical Engine, was possible. The work on the design of the Analytical Engine started in 1834. (More information on these machines can be found in Exercise VIII).

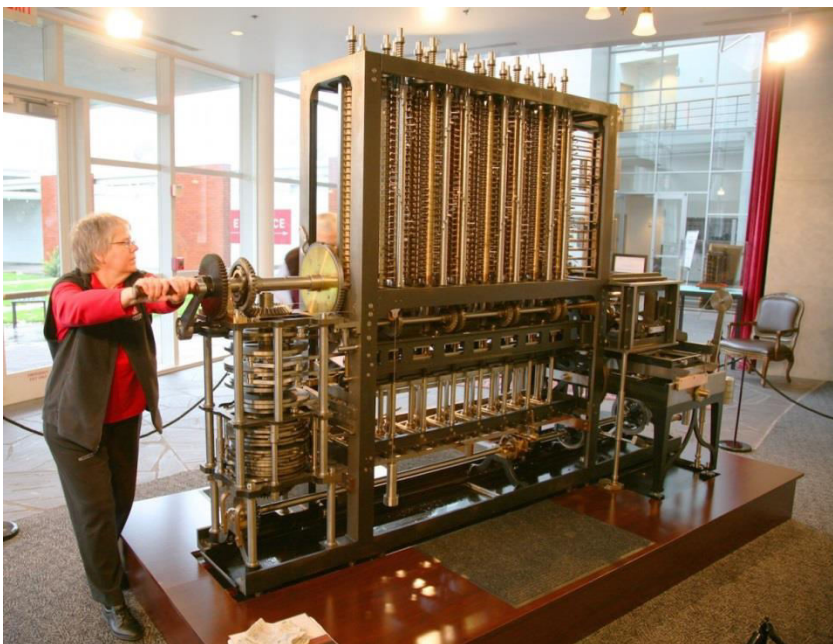


Fig. 3. The Difference Engine

In 1931 Vannevar Bush (1890-1974) developed a calculator for solving differential equations. The machine could solve complex differential equations that had long left scientists and mathematicians baffled. The machine was cumbersome because hundreds of gears and shafts were required to represent numbers and their various relationships to each other.



Fig. 4. The Vannevar Bush's calculator.

[http://www.dia.eui.upm.es/asignatu/sis\\_op1/comp\\_hd/comp\\_hd.htm](http://www.dia.eui.upm.es/asignatu/sis_op1/comp_hd/comp_hd.htm)

### ***III. Translate from English into Russian:***

1) ancestors used to reside in cave; 2) a system of sliding beads; 3) to keep trading transactions.; 4) a base of ten; 5) drawback; 6) predecessor; 7) a system of gears and dials; 8) gained widespread use; 9) enhanced versatility; 10) withdrew its funding; 11) left scientists and mathematicians baffled.

### ***IV. Close the text and complete the sentences by memory:***

1. In early days when our ancestors used to reside in cave the ... was a problem.

2. The abacus allowed users to make computations using a system of ...  
...arranged on a rack.
3. In 1642 Pascal invented a ... wheel ... to help his father with his duties.
4. The ... to the Pascaline was its limitation to ... .
5. Leibniz ... the Pascaline by creating a machine that could also....
6. Colmar's calculator presented a more practical ... to computing because it could add, ... , multiply and divide.
7. The Difference Engine was a ... machine designed to tabulate logarithms and ... functions by evaluating finite differences to create ... polynomials.
8. ... the British government withdrew its ... for the project.
9. During this project, he realized that a much more general design, the ... ... , was possible.
10. The Vannevar Bush's machine could solve complex differential ... that had long left scientists and mathematicians... .

***V. Find English equivalents from the text:***

- 1) производить вычисления; 2) потерять значение; 3) значительный прогресс; 4) сделать полный оборот; 5) недостаток; 6) усовершенствовать; 7) выполнять арифметические операции; 8) повышенная приспособляемость; 9) специализированный; 10) оценивать конечную разность; 11) прекратить финансирование; 12) решать дифференциальные уравнения

***VI. Find derivatives from the text for the following words:***

- 1) exist; 2) possess; 3) compute; 4) number; 5) move; 6) revolve; 7) wide; 8) versatile; 9) differ; 10) construct; 11) relate; 12) limit;

***VII. Answer the following questions:***

- 1) Did computer history start with electronic ones?

- 2) Who was the abacus used by?
- 3) What numerical system did the Pascal's machine use?
- 4) What was the drawback of the Pascaline?
- 5) Who improved the Pascaline by creating a machine that could also multiply?
- 6) Which functions could Colmar's mechanical calculator perform?
- 7) What was the name of the first Babbage's mechanical computing device?
- 8) Why wasn't the construction of this machine completed?
- 9) What could Vannevar Bush's calculator solve?
- 10) Why was its machine cumbersome?

***VIII. Read the text about the Charles Babbage's mechanical computer. Make up a plan for the text in the form of questions. Then give a short summary of the text using Appendix I.***

Charles Babbage (1791-1871) was an English mathematician, philosopher, inventor and mechanical engineer. Along with Ada Lovelace, he is best remembered for originating the concept of a programmable computer. Frustrated at the many errors he found while examining calculations for the Royal Astronomical Society, Babbage declared, "I wish to God these calculations had been performed by steam!" With those words, the automation of computers had begun. By 1812, Babbage noticed a natural harmony between machines and mathematics: machines were best at performing tasks repeatedly without mistake; while mathematics, particularly the production of mathematic tables, often required the simple repetition of steps. The problem centered on applying the ability of machines to the needs of mathematics.



Fig. 5. Charles Babbage, the Father of the Computer.

Babbage's first attempt at solving this problem was in 1822 when he proposed a machine to perform differential equations, called a Difference Engine. Powered by steam and large as a locomotive, the machine would have a stored program and could perform calculations and print the results automatically. After working on the Difference Engine for 10 years, Babbage was suddenly inspired to begin work on the first general-purpose computer, which he called the Analytical Engine. Babbage's assistant, Augusta Ada King, Countess of Lovelace (1815-1842) and daughter of English poet Lord Byron, was instrumental in the machine's design.



Fig. 6. Ada Lovelace.

One of the few people who understood the Engine's design as well as Babbage, she helped revise plans, secure funding from the British government, and communicate the specifics of the Analytical Engine to the public. Also, Lady Lovelace's fine understanding of the machine allowed her to create the instruction routines to be fed into the computer, making her the first female computer programmer. In the 1980's, the U.S. Defense Department named a programming language ADA in her honor.

Babbage's steam-powered Engine, although ultimately never constructed, may seem primitive by today's standards. However, it outlined the basic elements of a

modern general purpose computer and was a breakthrough concept. Consisting of over 50,000 components, the basic design of the Analytical Engine included input devices in the form of perforated cards containing operating instructions and a "store" for memory of 1,000 numbers of up to 50 decimal digits long. It also contained a "mill" with a control unit that allowed processing instructions in any sequence, and output devices to produce printed results. Babbage borrowed the idea of punch cards to encode the machine's instructions from the Jacquard loom. The loom, produced in 1820 and named after its inventor, Joseph-Marie Jacquard, used punched boards that controlled the patterns to be woven.

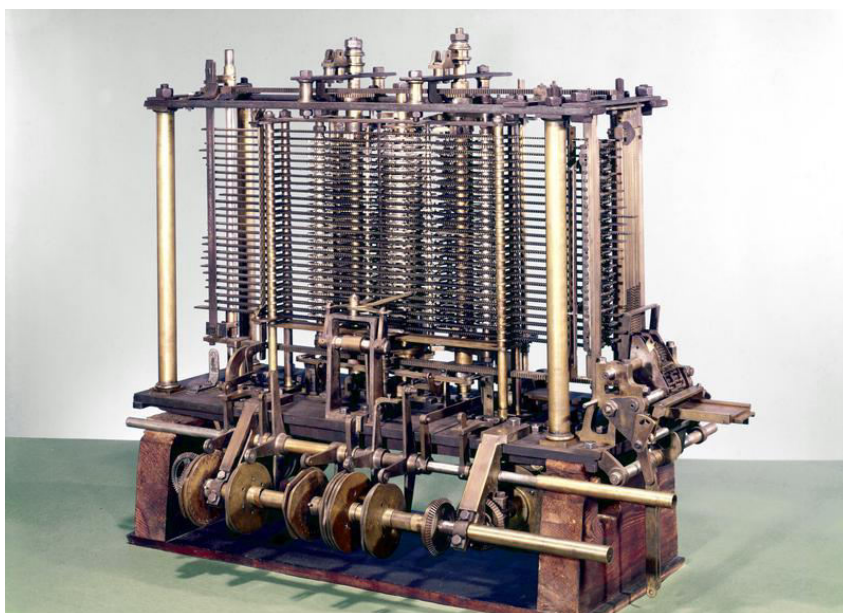


Fig. 7. Analytical Engine.

### ***IX. Translate sentences from Russian into English:***

- 1) Несколько тысячелетий назад в Древнем Египте, затем в Древней Греции и Древнем Риме использовались механические счеты абак с передвижными костяшками.
- 2) Первым человеком, создавшим счетную машину, был французский ученый Блез Паскаль, в честь которого назван один из языков программирования.

- 3) Великий немецкий математик Готфрид Вильгельм Лейбниц (1646-1716) построил другую механическую машину, которая помимо сложения и вычитания могла выполнять операции умножения и деления. В сущности, Лейбниц три века назад создал подобие карманного калькулятора с четырьмя функциями.
- 4) Чарльз Ксавье Томас создал первое серийно выпускавшееся механическое счётное устройство — арифмометр Томаса, который мог складывать, вычитать, умножать и делить. В основном, он был основан на работе Лейбница.
- 5) Чарльз Бэббидж разработал и сконструировал разностную машину. Эта механическая машина, которая, как и машина Паскаля, могла лишь складывать и вычитать, подсчитывала таблицы чисел для морской навигации. В машину был заложен только один алгоритм — метод конечных разностей с использованием полиномов.
- 6) Преимущество аналитической машины было в том, что в отличие от разностной она могла выполнять несколько алгоритмов.
- 7) Поскольку аналитическая машина программировалась на элементарном ассемблере, ей было необходимо программное обеспечение.
- 8) Чтобы создать это программное обеспечение, Бэббидж нанял молодую женщину — Аду Августу Ловлейс, дочь знаменитого британского поэта Байрона.
- 9) Ада Ловлейс была первым в мире программистом. В ее честь назван современный язык программирования — Ada.
- 10) Справедливо будет сказать, что Бэббидж был дедушкой современного цифрового компьютера.

***X. Make presentation on some of mechanical computing machines.***



## Unit 2

### The First Freely Programmable Computer

#### *I. Pre-reading task*

#### *Answer the following question:*

Do you know who invented the first calculating device that had all features of modern computer?

#### *II. Read the text and check your answers.*

**Konrad Zuse** (1910-1995) was a construction engineer for the Henschel Aircraft Company in Berlin, Germany at the beginning of WWII. Konrad Zuse earned the semiofficial title of "inventor of the modern computer" for his series of automatic calculators, which he invented to help him with his lengthy engineering calculations. Zuse has modestly dismissed the title while praising many of the inventions of his contemporaries and successors as being equally if not more important than his own.





Fig. 1. Konrad Zuse.

One of the most difficult aspects of doing a large calculation with either a slide rule or a mechanical adding machine is keeping track of all intermediate results and using them, in their proper place, in later steps of the calculation. Konrad Zuse wanted to overcome that difficulty. He realized that an automatic-calculator device would require three basic elements: a control, a memory, and a calculator for the arithmetic.

In 1936, Zuse made a mechanical calculator called the Z1, the first binary computer. Zuse used it to explore several groundbreaking technologies in calculator development: floating-point arithmetic, high-capacity memory and modules or relays operating on the yes/no principle. Zuse's ideas, not fully implemented in the Z1, succeeded more with each Z prototype.

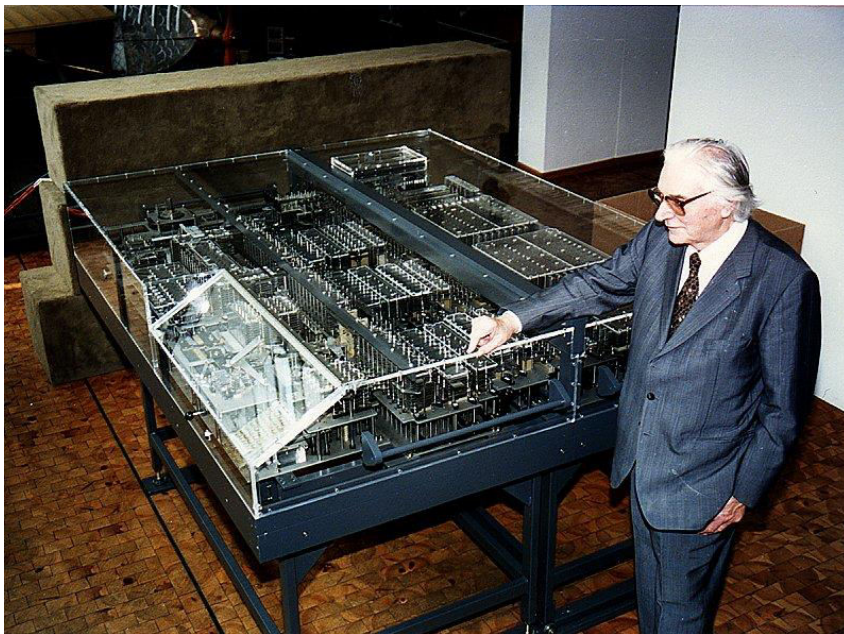


Fig. 2. Konrad Zuse's Z1 computer.

In 1939, Zuse completed the Z2, the first fully functioning electro-mechanical computer.

Konrad Zuse completed the Z3 in 1941, with recycled materials donated by fellow university staff and students. This was the world's first electronic, fully

programmable digital computer based on a binary floating-point number and switching system. Zuse used old movie film to store his programs and data for the Z3, instead of using paper tape or punched cards. Paper was in short supply in Germany during the war.

According to "The Life and Work of Konrad Zuse" (by Horst Zuse)

In 1941, the Z3 contained almost all of the features of a modern computer as defined by John von Neumann and his colleagues in 1946. The only exception was the ability to store the program in the memory together with the data. Konrad Zuse did not implement this feature in the Z3, because his 64-word memory was too small to support this mode of operation. Due to the fact that he wanted to calculate thousands of instructions in a meaningful order, he only used the memory to store values or numbers.

The block structure of the Z3 is very similar to a modern computer. The Z3 consisted of separate units, such as a punch tape reader, control unit, floating-point arithmetic unit, and input/output devices.



Fig. 2. Konrad Zuse's Z3 computer.

Konrad Zuse wrote the first algorithmic programming language called 'Plankalkül' in 1946, which he used to program his computers. He wrote the world's first chess-playing program using Plankalkül. The Plankalkül language included arrays and records and used a style of assignment (storing the value of an expression in a variable) in which the new value appears in the right column. An array is a collection of identically typed data items distinguished by their indices (or "subscripts"), for example written something like  $A[i,j,k]$ , where  $A$  is the array name and  $i$ ,  $j$  and  $k$  are the indices. Arrays are best when accessed in an unpredictable order. This is in contrast to lists, which are best when accessed sequentially.

Zuse was unable to convince the Nazi government to support his work for a computer based on electronic valves. The Germans thought they were close to winning the War and felt no need to support further research.

The Z1 through Z3 models were destroyed during the war along with Zuse Apparatebau, the first computer company that Zuse formed in 1940. Zuse left for Zurich to finish his work on the Z4, smuggling the Z4 from Germany in a military truck, which he hid in stables on route to Zurich, Switzerland. He completed and installed the Z4 in the Applied Mathematics Division of Zurich's Federal Polytechnical Institute, in use there until 1955. The Z4 had a mechanical memory with a capacity of 1,024 words and several card readers. Zuse no longer had to use movie film to store programs; he could now use punched cards. The Z4 had punches and various facilities to enable flexible programming including address translation and conditional branching. In 1949, he moved back to Germany to form a second company called Zuse KG for the construction and marketing of his designs. Zuse later rebuilt models of the Z3 in 1960 and the Z1 in 1984.

<http://inventors.about.com/library/weekly/aa050298.htm>

### ***III. Translate from English into Russian:***

1) lengthy engineering calculations; 2) an automatic-calculator device; 3) binary computer; 4) floating-point arithmetic; 5) high-capacity memory; 6) to operate on the yes/no principle; 7) programmable digital computer; 8) binary floating-point number; 9) punched cards; 10) to store values or numbers; 11) punch tape reader; 12) control unit; 13) floating-point arithmetic unit; 14) input/output devices; 15) algorithmic programming language; 16) arrays; 17) conditional branching.

***IV. Complete the sentences with missing words and phrases according to the text. Translate the sentences.***

1. Konrad Zuse earned the semiofficial title of ... ..
2. One of the most difficult aspects of doing a large calculation is ... .. of all intermediate results and using them, in their proper place, in later steps of the ....
3. In 1936, Zuse made a mechanical calculator called the Z1, the first ... computer.
4. Zuse's ideas, not fully ... in the Z1, succeeded more with each Z prototype.
5. Konrad Zuse completed the Z3 in 1941, with ... .. donated by fellow university staff and students.
6. This was the world's first electronic, fully programmable ... computer based on a binary ... .. number and switching system.
7. Zuse used old movie film to ... his programs and data for the Z3, instead of using paper tape or ....
8. Konrad Zuse did not implement this feature in the Z3, because his ... .. was too small to support this mode of operation.
9. The Z3 consisted of separate units, such as a punch tape reader, ... , floating-point arithmetic unit, and ... / ... devices.
10. Konrad Zuse wrote the first algorithmic ... .. called 'Plankalkül' in 1946.
11. The Z4 had a mechanical memory with a ... of 1,024 words and several card readers.

12. The Z4 had punches and various facilities to enable ... .. including address translation and conditional branching.

***V. Match the first half of each sentence with the most appropriate second half***

1. He realized that an automatic-calculator device would require	a. the Applied Mathematics Division of Zurich's Federal Polytechnical Institute.
2. In 1939, Zuse completed the Z2	b. which he used to program his computers.
3. The Z3 contained almost all of the features of a modern computer	c. to support his work for a computer based on electronic valves.
4. The Z3's 64-word memory was too small	d. three basic elements: a control, a memory, and a calculator for the arithmetic.
5. Konrad Zuse wrote the first algorithmic programming language called 'Plankalkül' in 1946,	e. to store the program in the memory together with the data
6. Zuse was unable to convince the Nazi government	f. the first fully functioning electro-mechanical computer.
7. He completed and installed the Z4 in	g. as defined by John von Neumann and his colleagues in 1946.

***VI. Mark sentences as True or False. If they are false, explain why.***

1. Konrad Zuse believed that he had earned the title of "inventor of the modern computer" for his series of automatic calculators.
2. He realized that an automatic-calculator device would require three basic elements: a control, a memory, and a calculator for the arithmetic.

3. Zuse's ideas were fully implemented in his mechanical calculator Z1.
4. His next model Z2 was the first fully functioning electro-mechanical computer.
5. Konrad Zuse completed the Z3 in 1944, with recycled materials donated by fellow university staff and students.
6. Zuse used old X-ray film to store his programs and data for the Z3, instead of using paper tape or punched cards.
7. The Z3 contained almost all of the features of a modern computer as defined by John von Neumann and his colleagues in 1946.
8. The block structure of the Z3 was different from a modern computer.
9. Konrad Zuse wrote the first algorithmic programming language called 'Plankalkül' in 1946, which he used only to write chess-playing programs.
10. He completed and installed the Z4 in the Applied Mathematics Division of Zurich's Federal Polytechnical Institute in 1955.

**VII. Find derivatives in the text for the following words. Explain their meaning or translate into Russian:**

1. <b>calculate</b>	<i>2 nouns</i>	—
2. <b>invent</b>	<i>2 nouns</i>	—
3. <b>break</b>	<i>adjective</i>	—
4. <b>capable</b>	<i>noun</i>	—
5. <b>cycle</b>	<i>verb</i>	<i>adjective</i>
6. <b>program</b>	<i>adjective</i>	<i>noun</i>
7. <b>sequence</b>	<i>adverb</i>	—

**VIII. Translate from Russian into English:**

1. Конрад Цузе изобрел свой компьютер для того, чтобы облегчить сложные инженерные расчеты, необходимые ему для работы.

2. В 1936 г. он создал первый механический калькулятор, Z1, который явился первым бинарным компьютером.
3. Z3 был первым в мире электронным программируемым цифровым компьютером.
4. Z3, созданный в 1943г., содержал в себе все черты современных компьютеров, сформулированные проф. фон Нейманом в 1946 г.
5. Z3 имел блочную структуру и состоял из таких модулей, как блок управления, устройство считывания с перфокарт, блок вычислений для чисел с плавающей запятой, устройства ввода-вывода и т.д.
6. Первый язык программирования, называемый 'Plankalkül', был создан в 1946г.
7. К. Цузе нелегально вывез Z4 из Германии в военном грузовике, чтобы продолжить свою работу в Швейцарии.
8. Z4 имел механическую память емкостью в 1,024 слов.

***IX. Answer the following questions:***

1. What do you know about Konrad Zuse? What is he famous for?
2. What kind of difficulty did he want to overcome?
3. When was the first binary computer invented? In what way was it used by K.Zuse?
4. What kind of machine was Z2?
5. Why were recycled materials used for the creation of Z3?
6. Why was not Z3 able to store the program in the memory together with the data?
7. Which units did Z3 consist of?
8. What kind of program did K.Zuse write using his programming language called 'Plankalkül'?
9. Why didn't the Nazi government support Zuse's work?
10. Where did Zuse have to complete his Z4 computer?

11. What kind of memory did Z4 have?

12. What were the names of Zuse's computer companies?

***X. Make up a plan to the text and render the text according to the plan.***

### ***Unit 3***

#### **The Atanasoff-Berry Computer – the First Electronic Computer**

##### ***II. Pre-reading task.***

Before you study the text read John Atanasoff's words to reporters and try to guess the message of his words: *"I have always taken the position that there is enough credit for everyone in the invention and development of the electronic computer"*.

***II. Read the text, then tell if you were right about the meaning of the quote given in the pre-reading task.***



functions.

Professor John Atanasoff and graduate student Clifford Berry built the world's first electronic-digital computer at Iowa State University between 1939 and 1942. The Atanasoff-Berry Computer represented several innovations in computing, including a binary system of arithmetic, parallel processing, regenerative memory, and a separation of memory and computing

Presper Eckert and John Mauchly were the first to patent a digital computing device, the ENIAC computer. A patent infringement case (Sperry Rand Vs.



Honeywell, 1973) voided the ENIAC patent as a derivative of John Atanasoff's invention. Atanasoff was quite generous in stating, "there is enough credit for everyone in the invention and development of the electronic computer." Eckert and Mauchly received most of the credit for inventing the first electronic-digital computer. Historians now say that the Atanasoff-Berry computer was the first.

"It was at an evening of scotch and 100 mph car rides," John Atanasoff told reporters, "when the concept came, for an electronically operated machine, that would use base-two (binary) numbers instead of the traditional base-10 numbers, condensers for memory, and a regenerative process to preclude loss of memory from electrical failure."

John Atanasoff wrote most of the concepts of the first modern computer on the back of a cocktail napkin. He was very fond of fast cars and scotch.



Fig.1. Clifford Berry.

In late 1939, John Atanasoff teamed up with Clifford Berry to build a prototype. They created the first computing machine to use electricity, vacuum tubes, binary numbers and capacitors. The capacitors were in a rotating drum that held the electrical charge for the memory. The brilliant and inventive Berry, with his background in electronics and mechanical construction skills, was the ideal

partner for Atanasoff. The prototype won the team a grant of \$850 to build a full-scale model. They spent the next two years further improving the Atanasoff-Berry Computer. The final product was the size of a desk, weighed 700 pounds, had over 300 vacuum tubes, and contained a mile of wire.

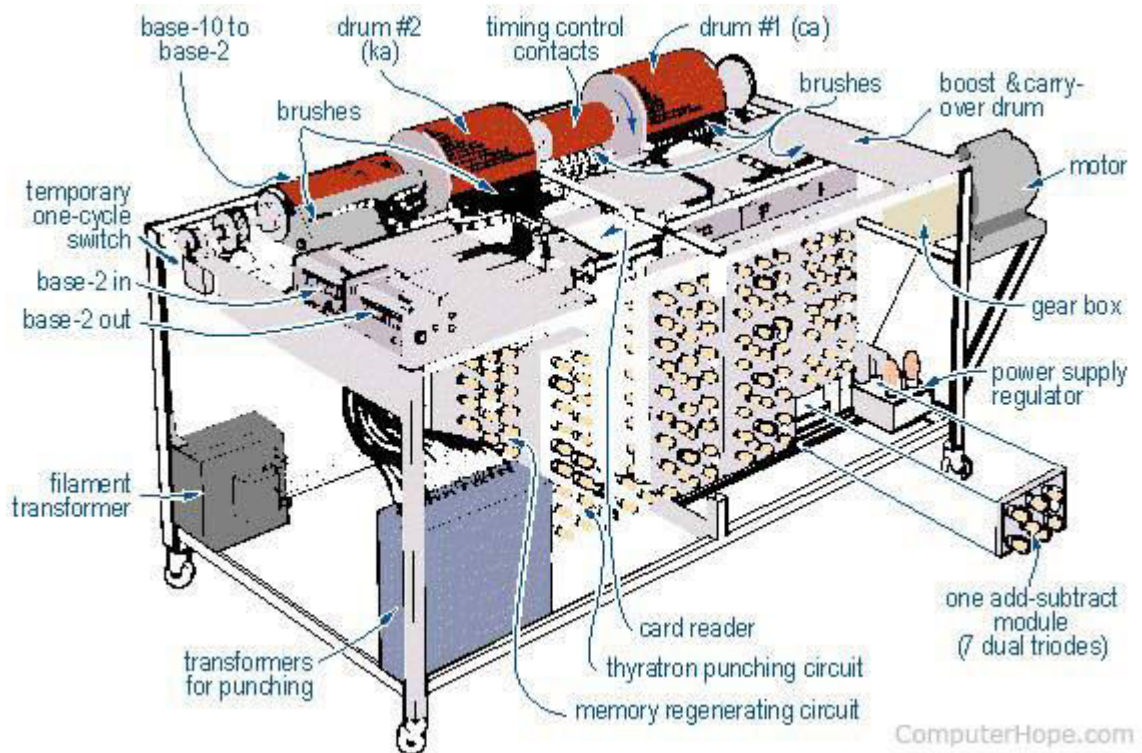


Fig.3. The Atanasoff-Berry Computer ,

The computer could calculate about one operation every 15 seconds, today a computer can calculate 150 billion operations in 15 seconds. Too large to go anywhere, it remained in the basement of the physics department. The war effort prevented John Atanasoff from finishing the patent process and doing any further work on the computer. When they needed storage space in the physics building, they dismantled the Atanasoff-Berry Computer.

<http://inventors.about.com/library/weekly/aa050898.htm>

**III. Give Russian equivalents to the following words and word phrases:**

1) electronic-digital computer; 2) binary system of arithmetic; 3) parallel processing; 4) regenerative memory; 5) a patent infringement case; 6) receive credit for; 7) void smth; 8) condenser; 9) preclude loss of memory; 10) electrical failure; 11) vacuum tube; 12) capacitor; 13) rotating drum; 14) hold the electrical charge for the memory; 15) full-scale model; 16) dismantle.

***IV. Basing on the text match the words with similar meaning:***

To name, to complete, to calculate, to develop, to keep, to interpret, to communicate, to fulfill, to apply, to translate, to improve, to build, to call, to store, to communicate, to figure out, to perform, to use, to finish, to construct, to connect; speed, aim, storage, information, machine, significance, computation, data, device, rate, calculation, purpose, memory, importance.

***V. Match the words on the left with their definitions on the right:***

vacuum tube	a piece of equipment that reduces gases to their liquid or solid form
capacitor	to take a machine apart or to come apart into separate pieces
condenser	To perform a mathematical process; figure
binary system	a device which collects and stores electricity, and is an important part of electronic equipment such as televisions and radios
dismantle	a number system which represents numeric values using two symbols, usually 0 and 1
calculate	a device used to amplify, switch, otherwise modify, or create an electrical signal by controlling the movement of electrons in a low-pressure space.

## ***VI. Cover the text and complete the sentences by memory:***

1. The Atanasoff-Berry Computer represented several innovations in computing, including . . . .
2. Eckert and Mauchly received most of the credit for . . . .
3. "It was at an evening of scotch and 100 mph car rides," John Atanasoff told reporters, . . . .
4. John Atanasoff wrote most of the concepts of the first modern computer. . . .
5. In 1939 Atanasoff and Berry created the first computing machine to use electricity, . . . .
6. The brilliant and inventive Berry, with his background in electronics and mechanical construction skills, . . . .
7. The prototype won the team a grant of \$850 to . . . .
8. The final product was the size of a desk, weighed 700 pounds, . . . .
9. The war effort prevented John Atanasoff from . . . .

## ***VII. Translate sentences from Russian into English:***

1. Компьютер Атанасова-Берри — первое цифровое вычислительное устройство, а также первая вычислительная машина без движущихся частей
2. Задуманная в 1937 году, машина не была программируемой, и разрабатывалась только в целях решения систем линейных уравнений.
3. Идеи и принципы создания цифрового компьютера пришли к Атанасову, как он вспоминает, зимним вечером 1937 года в придорожной таверне.
4. Позднее он сформулировал суть этих принципов: в своей работе компьютер будет использовать электричество и достижения электроники:
  - его работа будет основана на двоичной, а не десятичной системе счисления;
  - основой запоминающего устройства будут служить конденсаторы;

- будут использованы логические электронные схемы.

5. Проектирование и конструирование компьютера осуществлялось с конца 1939 года до середины 1942 года.

6. Клиффорд Берри пишет, что “единственным крупным узлом, не законченным к моменту прекращения работы в середине 1942 года, была схема считывания для двоичных карт. Основная вычислительная часть машины была закончена и работала более года, но от нее было мало толку без средств для хранения промежуточных результатов”.

7. Атанасов рассказал Маучли о его незаконченной машине, компьютере, использующем электронные лампы, и о том, что, они, возможно, будут иметь большое влияние на цифровые компьютеры. Атанасов пригласил Маучли (создателя ENIAC) приехать в Айову посмотреть ABC.

8. Вторая мировая война заставила Атанасова отойти от конструирования компьютеров. Годы спустя он сожалел, что оставил свои усилия по созданию компьютера, но он это понял только тогда, когда стало очевидно, что его машина была поистине революционной.

9. Работа Атанасова и Берри над вычислительной машиной долгое время не была широко известна, пока в 1960-х годах о ней не узнали в ходе конфликта по поводу первого появления электронного компьютера.

10. Первоначально было определено, что первым компьютером в современном смысле этого слова является ENIAC, однако в 1973 году Федеральный районный суд США постановил отозвать патент ENIAC и заключил, что ABC является первым «компьютером».

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

1. Who was the first to build electronic-digital computer?
2. When and where did it happen?
3. What were the innovations of the first electronic-digital computer?

4. How can you explain that Presper Eckert and John Mauchly were the first to patent a digital computing device?
5. What is ENIAC?
6. How did John Atanasoff get the idea of the first modern computer?
7. How long did it take Atanasoff and Berry to build a full-scale model of electronic-digital computer?
8. What were the characteristics of the Atanasoff-Berry computer?
9. Where was it stored?
10. How long did Atanasoff-Berry computer perform its functions?

***IX. Get divided into two groups. The first group is to prove that the first electronic-digital computer was invented by Atanasoff and Berry. The second group is to give reasons that Eckert and Mauchly had the right to patent their digital computing device. While preparing for discussion use additional information.***

***X. Prepare presentation on Atanasoff and Berry computer.***

## MODULE 2

### First generation computers (1945-1956)

#### *I. Pre-reading task. Answer the following questions:*

- Without looking at the text, try to summarize what was special about this kind of computers?
- Can you give any examples of the 1<sup>st</sup> generation computers?

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

During the period of 1940 to 1956 first generation of computers were developed. The first generation computers used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. The vacuum tube was developed by Lee DeForest. A vacuum tube is a device generally used to amplify a signal by controlling the movement of electrons in an evacuated space. The use of vacuum tubes was responsible for their breathtaking size.

First generation computers were characterized by the fact that operating instructions were made-to-order for the specific task for which the computer was to be used. Each computer had a different binary-coded program called a machine language that told it how to operate. This made the computer difficult to program and limited its versatility and speed.

First generation computers were very expensive to operate and in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions.

### **CHARACTERISTICS**

- 1) First generation computers were based on vacuum tubes.
- 2) The operating systems of the first generation computers were very slow.
- 3) They were very large in size.

- 4) Production of the heat was in large amount in first generation computers.
- 5) Machine language was used for programming.
- 6) First generation computers were unreliable.
- 7) They were difficult to program and use.

***III. 1) Cover the text and answer the questions:***

- 1) What time was the first generation of computers developed?
- 2) Who developed the vacuum tube?
- 3) What kind of device is the vacuum tube?
- 4) What kind of language did these computers use?
- 5) What were the shortcomings of the 1<sup>st</sup> generation computers?

***2) Cover the text and list all characteristics of the 1<sup>st</sup> generation computers.***

## **Unit 4**

### **The Harvard MARK I Computer**

***I. Pre-reading task.***

***Before you read the text answer the following questions:***

1. How big were the first computers made after the World War II?
2. How many operations per second were they able to perform?
3. Have you ever heard of the names of Howard Aiken and Grace Hopper?  
What are they famous for?

***II. Read the text and check your answers.***

Howard Aiken and Grace Hopper designed the MARK series of computers at Harvard University. The MARK series of computers began with the Mark I in 1944. Imagine a giant roomful of noisy, clicking metal parts, 55 feet long and 8 feet high. The 5-ton device contained almost 760,000 separate pieces. Used by the



US Navy for gunnery and ballistic calculations, the Mark I was in operation until 1959.

The computer, controlled by pre-punched paper tape, could carry out addition, subtraction, multiplication, division and reference to previous results. It had special subroutines for logarithms and trigonometric functions and used 23 decimal place numbers. Data was stored and counted mechanically using 3000 decimal storage wheels, 1400 rotary dial switches, and 500 miles of wire. Its electromagnetic relays classified the machine as a relay computer. All output was displayed on an electric typewriter. By today's standards, the Mark I was slow, requiring 3-5 seconds for a multiplication operation.

### **Howard Aiken**

Born: 9 March 1900 in Hoboken, New Jersey, USA

Died: 14 March 1973 in St. Louis, Missouri, USA

- Howard Aiken was an electrical engineer and physicist who first conceived of an electro-mechanical device like the Mark I in 1937. After completing his doctorate at Harvard in 1939, Aiken stayed on to continue the computer's development. IBM funded his research. Aiken headed a team of three engineers including Grace Hopper.

- The Mark I reached completion in 1944.

- In 1947, Howard Aiken completed the Mark II, an electronic computer. The same year he founded the Harvard Computation Laboratory.

- He later published numerous articles on electronics and switching theory and started Aiken Industries.

- Howard Aiken loved computers, but even he had no idea of their eventual widespread appeal. "Only six electronic digital computers would be required to satisfy the computing needs of the entire United States," he said in 1947.

## Grace Hopper

Born: 9 Dec 1906 in New York, USA

Died: 1 Jan 1992 in Arlington, Virginia, USA

- Grace Hopper studied at Vassar College and Yale and then joined the Naval Reserve in 1943. In 1944, she started working with Aiken on the Harvard Mark I computer.

- Grace Hopper is responsible for the term '**bug**' for a computer fault. The original 'bug' was a moth, which caused a hardware fault in the Mark I. Hopper was the first person to 'debug' a computer.

- In 1949, Grace Hopper started research for the Eckert-Mauchly Computer Corporation where she designed an improved compiler and was part of the team which developed Flow-Matic, the first English-language data processing compiler.

- She invented the language APT and verified the language COBOL.

- Grace Hopper was the first computer science "Man of the Year" in 1969.

<http://inventors.about.com/library/weekly/aa052198.htm>

### ***III. Close the text and tell whether the following sentences are true or false:***

1. Howard Aiken and Grace Hopper designed the MARK series of computers at Oxford University.
2. Mark I computer was 55 feet long and 8 feet high.
3. Mark I was used by the UK Navy for gunnery and ballistic calculations.
4. The computer was controlled by pre-punched paper tape.
5. Mark I could carry out all algebraic and logical operations.
6. It had special subroutines for word processing functions.
7. Mark I was classified as a relay computer.
8. By today's standards, the Mark I was extremely fast.
9. H.Aiken headed a team of thirteen engineers including Grace Hopper.
10. Grace Hopper received the National Medal of Technology in 1999.

***IV. Fill in the gaps in the following sentences:***

1. The MARK series of ... began with the Mark I in 1944.
2. The 5-ton ... contained almost 760,000 separate pieces.
3. Used by the US Navy for gunnery and ... .., the Mark I was ... .. until 1959.
4. The computer could ... .. addition, subtraction, multiplication, division and reference to previous results.
5. It had special ... for logarithms and trigonometric functions.
6. Data was stored and counted mechanically using 3000 decimal ... .., 1400 rotary ... .., and 500 miles of ... .
7. Its electromagnetic ... classified the machine as a ... computer.
8. All ... was displayed on an electric ... .
9. Mark I was slow, requiring 3-5 seconds for a ... operation.
10. Aiken ... a team of three engineers including Grace Hopper.
11. Grace Hopper is responsible for the term ... for a computer fault.
12. Grace Hopper was part of the team which developed Flow-Matic, the first English-language ... .. compiler.

***V. Translate from English into Russian.***

1) to be in operation; 2) to be controlled (by); 3) to carry out subtraction; 4) subroutines; 5) decimal; 5) to display output; 6) electric typewriter; 7) multiplication operation; 8) to complete one's doctorate; 9) articles on electronics and switching theory; 10) to 'debug' a computer; 11) started research; 12) data processing compiler.

***VI. Find derivatives in the text for the following words:***

1) noise; 2) gun; 3) to calculate; 4) to operate; 5) to punch; 6) to add; 7) to subtract; 8) to multiply; 9) to divide; 11) routine; 12) mechanic; 13) to store; 14) to type.

***VII. Cover the text and answer the following questions:***

- 1) Which computer did the MARK series of computers begin?
- 2) What was the weight of the device?
- 3) How many separate pieces did it contain?
- 4) What purposes was it used, and how long?
- 5) What operations could it carry out?
- 6) What kind of special subroutines did it have?
- 7) How was data stored in Mark I?
- 8) How was the output was displayed?
- 9) Why was Mark I slow by modern standards?

***VIII. Translate the following sentences from Russian into English.***

- 1) Первый компьютер, использовавший при работе только электронные компоненты, был разработан и создан в 1941 году.
- 2) При участии IBM пять инженеров во главе с Говардом Эйканом, воплотили в жизнь идеи изобретателя Чарльза Бэббиджа, который еще в 1833 разработал проект цифровой вычислительной машины, но не смог реализовать из-за низкого уровня технологий того времени.
- 3) Машину сперва назвали "Автоматический программируемый вычислитель" (Automatic Sequence Controlled Calculator), но дело в том, что на церемонии запуска компьютера Говард Эйкен не упомянул о какой-либо роли IBM в создании машины. В итоге спонсоры откололись (gave the project up), а название компьютера пришлось сменить на свое.
- 4) Первый официальный запуск компьютера состоялся 7 августа 1944 года.
- 5) «Марк» мог за 3 секунды вычитать и складывать, но делил и умножал чуть дольше (15,3 и 6 секунд соответственно)
- 6) По своей сути это был калькулятор, причем довольно слабый учитывая возможности современных калькуляторов.

7) Он последовательно считывал и выполнял инструкции с перфорированной бумажной ленты, а каждая программа представляла собой довольно длинный ленточный рулон.

8) Марк-1» мог оперировать всего 72 числами, состоящими из 23 десятичных разрядов.

9) Однако это был 1944 год, и машина способная без участия человека произвести математическое действие была прорывом (big break).

***IX. Remember at least three things that are H.Aiken and G.Hopper are famous for.***

***X. Make presentation concerning Mark I computer and its creators, H.Aiken and G.Hopper.***

## **Unit 5**

### **The ENIAC I Computer**

***I. Pre-reading task. Answer the following questions:***

1. Do you know what ENIAC stands for?
2. What is the extension of this abbreviation?

***II. Read the text using the dictionary if necessary.***

In 1946, John Mauchly and J Presper Eckert developed the ENIAC I (Electrical Numerical Integrator And Calculator). The U.S. military sponsored their research; they needed a calculating device for writing artillery-firing tables (the settings used for different weapons under varied conditions for target accuracy). The Ballistics Research Laboratory, or BRL (the branch of the military responsible for calculating the tables), heard about John Mauchly's research at the

University of Pennsylvania's Moore School of Electrical Engineering. John Mauchly had previously created several calculating machines, some with small electric motors inside. He had begun designing (1942) a better calculating machine based on the work of John Atanasoff that would use vacuum tubes to speed up calculations.

On May 31, 1943, the military commission on the new computer began; John Mauchly was the chief consultant and J Presper Eckert was the chief engineer. Eckert was a graduate student studying at the Moore School when he met John Mauchly in 1943. It took the team about one year to design the ENIAC and 18 months and 500,000 tax dollars to build it. By that time, the war was over. The ENIAC was still put to work by the military doing calculations for the design of a hydrogen bomb, weather prediction, cosmic-ray studies, thermal ignition, random-number studies and wind-tunnel design.

The ENIAC contained 17,468 vacuum tubes, along with 70,000 resistors, 10,000 capacitors, 1,500 relays, 6,000 manual switches and 5 million soldered joints. It covered 1800 square feet (167 square meters) of floor space, weighed 30 tons, consumed 160 kilowatts of electrical power. There was even a rumor that when turned on the ENIAC caused the city of Philadelphia to experience brownouts, however, this was first reported incorrectly by the Philadelphia Bulletin in 1946 and since then has become an urban myth.

In one second, the ENIAC (one thousand times faster than any other calculating machine to date) could perform 5,000 additions, 357 multiplications or 38 divisions. The use of vacuum tubes instead of switches and relays created the increase in speed, but it was not a quick machine to re-program. Programming changes would take the technicians weeks, and the machine always required long hours of maintenance. As a side note, research on the ENIAC led to many improvements in the vacuum tube.

In 1948, Dr. John Von Neumann made several modifications to the ENIAC. The ENIAC had performed arithmetic and transfer operations concurrently, which

caused programming difficulties. Von Neumann suggested that switches control code selection so pluggable cable connections could remain fixed. He added a converter code to enable serial operation.

In 1946, J Presper Eckert and John Mauchly started the Eckert-Mauchly Computer Corporation. In 1949, their company launched the BINAC (BINary Automatic) computer that used magnetic tape to store data.

In 1950, the Remington Rand Corporation bought the Eckert-Mauchly Computer Corporation and changed the name to the Univac Division of Remington Rand. Their research resulted in the UNIVAC (UNIVERSal Automatic Computer), an important forerunner of today's computers.

In 1955, Remington Rand merged with the Sperry Corporation and formed Sperry-Rand. Eckert remained with the company as an executive and continued with the company as it later merged with the Burroughs Corporation to become Unisys.

J Presper Eckert and John Mauchly both received the IEEE Computer Society Pioneer Award in 1980.

At 11:45 p.m., October 2, 1955, with the power finally shut off, the ENIAC retired.

<http://inventors.about.com/library/weekly/aa060298.htm>

### ***III. Read and decide which of the statements are true and which are false.***

***Change the sentences so they are true.***

1. ENIAC weighed 3 tons.
2. A converter code was added to ENIAC to enable serial operation.
3. It took the team two years and 750,000 tax dollars to build it.
4. The use of switches and relays created the increase in speed of the computer.
5. Research made by Univac Division of Remington Rand resulted in the important forerunner of today's computers.

### ***IV. Give Russian equivalents for the following words and word combinations:***

1) Advent; 2) elaborate calculations; 3) paramount; 4) cosmic-ray studies; 5) thermal ignition; 6) random-number studies; 7) wind-tunnel design; 8) relay; 9) manual switch; 10) soldered joints; 11) consume; 12) rumor; 13) maintenance; 14) concurrently; 15) pluggable cable connections; 16) enable; 17) forerunner; 18) merge.

***V. Fill in the gaps using words from the table:***

Enable, calculation, relay, research, magnetic tape, consume, merge, paramount, condition, increase
---

1. They decided to ... the two companies into one.
2. The ... that you made contained a few inaccuracies.
3. His ... resulted in some amazing discoveries.
4. Computerization should ... us to cut production costs by half.
5. ... is a device that reacts to a small change in an electrical current by moving switches or other devices in an electrical circuit.
6. There are many priorities, but reducing the budget deficit is paramount/is of ... importance.
7. ... is a long plastic strip coated with a magnetic substance, used to record sound or video signals or to store information in computers.
8. There has been some ... in business.
9. The house is not in good ... .
10. Our high living standards cause our present population to ... 25 percent of the world's oil.

***VI. Find derivatives in the text for the following words and translate them:***

1) number; 2) set; 3) accurate; 4) engineer; 5) to consult; 6) to predict; 7) to resist; 8) capacity; 9) correct; 11) to improve; 12) to modify; 13) able; 14) to program .



***VII. Answer the following questions:***

1. When was ENIAC developed? How long did it work?
2. Why did US military support this research?
3. What can you tell about J Presper Eckert's and John Mauchly's backgrounds?
4. How was ENIAC used when the war was over?
5. What was ENIAC's size and characteristics?
6. What kind of rumour existed about ENIAC?
7. What were advantages and disadvantage of ENIAC comparing to other calculating machines to date?
8. Improvements in what sphere were made thanks to research on ENIAC?
9. What kind of modifications did Von Neumann make to Eckert and Mauchly computer?
10. What are BINAC and UNIVAC?
11. Did ENIAC inventors get any awards?

***VIII. Translate the following sentences from Russian into English.***

1. ENIAC — первый электронный цифровой компьютер общего назначения, который можно было перепрограммировать.
2. Будучи сверхсекретным проектом Армии США, компьютер был представлен публике и прессе лишь много месяцев спустя после окончания войны — 14 февраля 1946 года. Именно благодаря ENIAC мы можем праздновать день компьютерщика 14 февраля.
3. В отличие от созданного в 1941 году Конрадом Цузе комплекса Z3, использовавшего механические реле, в компьютере ENIAC применялись вакуумные лампы.
4. В конце 1945 г., когда компьютер был наконец собран и готов к проведению первого испытания, Вторая мировая война окончилась.
5. В качестве испытания первой была поставлена задача по моделированию термоядерного взрыва супер-бомбы.

6. В дальнейшем компьютер использовали в основном для прогнозирования погоды, в том числе предсказания направления выпадения ядерных осадков.
7. Некоторые характеристики компьютера: согласно Википедии, он весил 27 тонн, потреблял 174 кВт энергии, а на его создание ушло более чем 500 000 долларов США.
8. Всего компьютер включал в себя 17 468 ламп 16 различных типов, 7200 кремниевых диодов, 1500 реле, 70 000 резисторов и 10 000 конденсаторов.
9. Такой огромный масштаб накладывал ограничения на скорость работы: выход из строя одной детали означал остановку работы всей машины и необходимость замены.
10. ENIAC нельзя было назвать совершенным компьютером. Он был построен в единственном экземпляре, и инженерные решения, реализованные в ENIAC, не использовались в последующих конструкциях компьютеров. Значение ENIAC заключается просто в его существовании, которое доказало возможность построения полностью электронного компьютера, способного работать достаточно продолжительное время, чтобы оправдать затраты на его постройку и принести ощутимые результаты.

***IX. Comment on the following extract:***

*"...With the advent of everyday use of elaborate calculations, speed has become paramount to such a high degree that there is no machine on the market today capable of satisfying the full demand of modern computational methods." – from the ENIAC patent (U.S.#3,120,606), filed on June 26, 1947.*

Can these words be related to present-day computer market?

Why (not)?

***X. Make a presentation about ENIAC computer using the active vocabulary from the text.***

## Unit 6

### The Williams Tube and the Manchester Baby

#### *I. Pre-reading task.*

#### *Answer the following questions:*

1. Do you know what a cathode-ray tube is?
2. In which way were these tubes used in computers in the 1940-s?
3. What object had the nickname of Manchester Baby?

#### *II. Read the text and check your answers.*

By 1946, a winner in the data-storage game emerged that would dominate the computer field for the next several years. Sir Frederick Williams and Tom Kilburn co-invented the Williams-Kilburn Tube (or Williams Tube), a type of altered cathode-ray tube. Scientists had conducted research on cathode-ray tubes serving as computer data storage since the early 1940s.

The illustration to the right is an example of the video display terminal used with the Manchester computer. The terminal mirrored what was happening within the Williams Tube. A metal detector plate placed close to the surface of the tube, detected changes in electrical discharges. Since the metal plate would obscure a clear view of the tube, the technicians could monitor the tubes used a video screen. Each dot on the screen represented a dot on the tube's surface; the dots on the tube's surface worked as capacitors that were either charged and bright or uncharged and dark. The information translated into binary code (0,1 or dark, bright) became a way to program the computer.

The Williams Tube provided the first large amount of random access memory (RAM), and it was a convenient method of data-storage. It did not require rewiring each time the data was changed, and programming the computer went much faster. It became the dominant form of computer memory until outdated by core memory in 1955.

### *History of the Manchester Baby*

In December 1946, Williams began to chair the Department of Electrical Engineering at the University in Manchester, England, with Tom Kilburn moving to Manchester as well. The men had both worked for the Telecommunications Research Establishment (TRE) in Malvern, England, trying to improve the digital storage ability of a cathode-ray tube.

Williams had already succeeded in storing one bit of information on a cathode-ray tube and had filed a provisional patent in December of 1946. Tom Kilburn soon devised an improved method of storing bits, increasing the storage capacity to 2048 bits. Williams added Kilburn's name to the patent. The team was ready to build a computer based on the Williams Tube.

In 1948, Tom Kilburn, assisted by another TRE researcher, Geoff Tootill, worked on designing and building a prototype machine. Nicknamed "The Baby," the new computer demonstrated the ability of the Williams Tube. For the first time in history, a computer used a stored program. Tom Kilburn wrote that computer program, first executed on June 21, 1948.

#### *Manchester Baby's Specifications:*

32-bit word length.

Serial binary arithmetic using 2 complement integers.

Single address format order code.

Random access main store of 32 words, extendable up to 8192 words.

Computing speed of around 1.2 milliseconds per instruction.

The team designed a second computer (Manchester Mark 1) and commissioned an outside company called Ferranti Ltd. to build the computer in 1949. Ferranti Ltd. and the Manchester University team collaborated in 1951 and built the world's first commercially available general-purpose computer called the Ferranti Mark 1. The first machine off the production line was delivered to the University of Manchester.

*Manchester Mark 1 Specs - Ferranti Mark 1 Specs*

Store organized in 40-bit addressable "lines," holding one 40-bit number or two 20-bit instructions.	Store organized in 20-bit addressable "lines," an instruction taking one line and a number two consecutive lines.
Serial 40-bit arithmetic with hardware add, subtract, and multiply and logical instructions.	Serial 40-bit arithmetic, with hardware add, subtract, and multiply and logical instructions and simple B-line arithmetic
2 modifier registers (B-lines, for modifying addresses in instructions.)	8 modifier registers (B-lines, for modifying addresses in instructions.)
Single address format order code - about 30 function codes.	Single address format order code - about 50-function codes.
4 pages of random access main store.	8 pages of random access main store.
128-page capacity drum backing store, 2 pages per track, about 30 milliseconds revolution time.	512-page capacity drum backing store, 2 pages per track, about 30 milliseconds revolution time.
Standard instruction time - 1.8 milliseconds, multiplication much slower.	Standard instruction time - 1.2 milliseconds, multiplication 2.16 milliseconds.

<http://inventors.about.com/library/weekly/aa060998.htm>

**III. Read and decide which of the statements are true and which are false.**

***Change the sentences so they are true.***

1. By 1946 the data-storage game was going to be over.
2. Williams Tube was invented by Sir Frederick Williams.
3. The dots on the tube's surface worked as capacitors that were either charged and bright or uncharged and dark.
4. The Williams Tube provided the first large amount of read-only memory.
5. In 1946 Williams filed a provisional patent on storing one bit of information on a cathode-ray tube.
6. Tom Kilburn devised an improved method of storing bits, increasing the storage capacity to 1024 bits.
7. Manchester Baby used a stored program for the first time in history.

**IV. Translate from English into Russian:**

1) cathode-ray tube; 2) computer data storage; 3) changes in electrical discharges; 4) to monitor the tubes; 5) to translate into binary code; 6) random access memory (RAM); 7) core memory; 8) to improve the digital storage ability; 9) to increase storage capacity; 10) to use 2 complement integers; 11) extendable up to 8192 words; 12) general-purpose computer; 13) modifier registers; 14) standard instruction time.

**V. Find derivatives from the text for the following words:**

1) to store; 2) to invent; 3) to detect; 4) to charge; 5) date; 6) success; 7) to extend.

**VI. Fill in the gaps in the following sentences:**

1. Sir Frederick Williams and Tom Kilburn ... the Williams-Kilburn Tube, a type of altered ... .. tube.

2. Scientists had conducted ... on cathode-ray tubes serving as computer ...  
... since the early 1940s.
3. A metal ... .. placed close to the surface of the tube, detected ... in  
electrical discharges.
4. Each dot on the ... represented a dot on the tube's ... .
5. The dots on the tube's surface worked as ... that were either charged and  
bright or uncharged and dark.
6. The information translated into ... .. became a way to program the  
computer.
7. The Williams Tube provided the first large amount of ... .. .
8. It became the dominant form of computer memory until outdated by ... ..  
in 1955.
9. The men had both worked for TRE in Malvern, England, trying to  
improve the ... .. ability of a cathode-ray tube.
10. Tom Kilburn soon devised an ... method of storing bits, increasing the  
... .. to 2048 bits.
11. For the first time in history, a computer used a ... program.
12. Ferranti Ltd. and the Manchester University team built the world's  
first commercially available ... .. computer called the Ferranti Mark 1.

***VII. Answer the following questions:***

1. When was the Williams-Kilburn Tube invented?
2. In what way could the technicians monitor the tubes?
3. Why was the Williams tube a convenient method of data-storage?
4. When was the Williams tube outdated by core memory?
5. What did Williams and Kilburn try to improve in 1946?
6. When was the Manchester Baby built?
7. What did the Manchester Baby demonstrate?
8. What was the nickname of the computer built in 1949?

9. What kind of computer was Ferranti Mark 1?
10. Where was the first machine off the production line delivered to?

***IX. Translate the following sentences from Russian into English.***

1. В 1946 году британский инженер Фредерик Уильямс изобрёл запоминающее устройство на основе электронно-лучевой трубки, и в декабре подал заявку на патент.
2. В 1947—1948 гг. Уильямсу и Томасу Килберну в Университете Манчестера удалось значительно усовершенствовать изначальную конструкцию и создать трубку с ёмкостью 2048 битов.
3. Летом 1948 года появился первый компьютер с памятью на трубках их конструкции — Манчестерская МЭМ.
4. Концепцию хранимой в памяти компьютера программы предложил в 1944г. Джон Экерт, но всё же все же первые машины с хранимой программой заработали в Англии, в Кембриджском и Манчестерском университетах.
5. Манчестерская малая экспериментальная машина (*Manchester Small-Scale Experimental Machine*), также известная как Baby — первый электронный компьютер, построенный по принципу совместного хранения данных и программ в памяти.
6. Осенью 1948 г. состоялся запуск машины в опытную эксплуатацию перед комиссией Министерства обороны, курировавшей проект.
7. Манчестерские компьютеры — серия инновационных электронных компьютеров с хранимой в памяти программой, которая разрабатывалась в течение 30-летнего периода с 1947 по 1977 годы небольшой командой инженеров и учёных Манчестерского университета под руководством Тома Килберна.
8. Проект имел две цели: доказать практическую применимость трубок Вильямса — ранней формы оперативного запоминающего устройства,



- основанного на стандартных электронно-лучевых трубках, и провести исследования того, как компьютеры могут помочь в решении математических задач.
9. Манчестерский компьютер Марк I привлек внимание британского правительства, которое наняло компанию Ferranti для создания коммерческих копий этих компьютеров. Пожалуй, главным новшеством в Марк I было использование индексных регистров, которые сейчас используются во всех современных компьютерах.
  10. В результате компьютер Ferranti Mark 1 стал первым в мире коммерческим компьютером, предназначенным для решения задач общего назначения.
  11. В 1950-х годах компания Ferranti создала коммерческий компьютер Ferranti Mercury, в котором трубки Вильямса были заменены на более надежную память на магнитных сердечниках.

***IX. Render the text using the vocabulary from IV.***

***X. Prepare presentation on the 1<sup>st</sup> generation computers.***

## MODULE 3. Second generation computers

### Unit 7

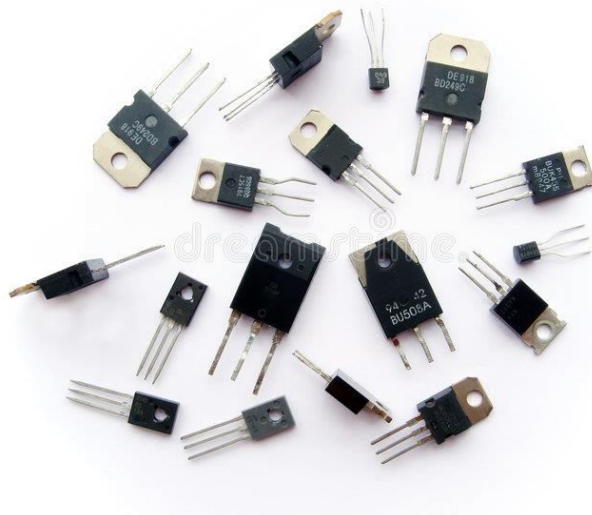
#### The invention of semiconductor transistors

##### *I. Pre-reading task:*

##### *Answer the following questions:*

1. What is semiconductor transistor?
2. When and who invented semiconductor transistors?

##### *II. Read the text and check your answers for task I.*



The transistor is an influential invention that changed the course of history for computers. The first generation of computers used vacuum tubes; the second generation of computers used transistors; the third generation of computers

used integrated circuits; and the fourth generation of computers used microprocessors.

John Bardeen, William Shockley, and Walter Brattain, scientists at the Bell Telephone Laboratories in Murray Hill, New Jersey, were researching the behavior of crystals (germanium) as semi-conductors in an attempt to replace vacuum tubes as mechanical relays in telecommunications. The vacuum tube, used to amplify music and voice, made long-distance calling practical, but the tubes consumed power, created heat and burned out rapidly, requiring high maintenance.

The team's research was about to come to a fruitless end when a last attempt to try a purer substance as a contact point lead to the invention of the "point-

contact" transistor amplifier. In 1956, the team received the Nobel Prize in Physics for the invention of the transistor.

A transistor is a device composed of semi-conductor material that can both conduct and insulate (e.g. germanium and silicon). Transistors switch and modulate electronic current. Before transistors, digital circuits were composed of vacuum tubes. [Read the ENIAC story to learn all about the disadvantages of vacuum tubes in computers.] The transistor was the first device designed to act as both a transmitter, converting sound waves into electronic waves, and resistor, controlling electronic current. The name transistor comes from the 'trans' of transmitter and 'sistor' of resistor.

John Bardeen and Walter Brattain took out a patent for their transistor. William Shockley applied for a patent for the transistor effect and a transistor amplifier. Transistors transformed the world of electronics and had a huge impact on computer design. Transistors made of semiconductors replaced tubes in the construction of computers. By replacing bulky and unreliable vacuum tubes with transistors, computers could now perform the same functions, using less power and space.

<http://inventors.about.com/library/weekly/aa061698.htm>

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

1. Explain the main principle of dividing computers to four generations.
2. What kind of research did scientists Bardeen, Shockley, and Brattain make at the Bell Telephone Laboratories?
3. For what purpose were vacuum tubes used in phone calling?
4. What were disadvantages of vacuum tubes?
5. For what invention did the team get the Nobel Prize in Physics?
6. What is transistor?
7. What is the function of transistor?
8. Where does the name “transistor” originate from?
9. Did invention of transistor influence computer world? In what way?
10. Who got patent for transistor?

***IV. Give Russian equivalents to the following words and word combinations:***

1) Semiconductor transistor; 2) influential invention; 3) integrated circuits; 4) amplify; 5) high maintenance; 6) contact point; 7) insulate; 8) modulate electronic current; 9) have a huge impact on; 10) bulky.

***V. Guess what words from the text are meant by these definitions:***

1. a semiconductor device commonly used to amplify or switch electronic signals.
2. a substance, usually a solid chemical element or compound, that can conduct electricity under some conditions but not others, making it a good medium for the control of electrical current.
3. the first type of solid-state electronic transistor ever constructed.
4. an electronic device which, usually with the aid of an antenna, propagates an electromagnetic signal such as radio, television, or other telecommunications.
5. a part of an electrical circuit designed to produce a particular amount of resistance to the flow of current.

***VI. Choose one of the variants to complete the sentences:***

1. Transistors have many ... over vacuum tubes.  
♦ patterns ♦ advantages ♦ scales
2. They ... very little power.  
♦ consume ♦ generate ♦ embrace
3. An integrated circuit is a group of elements connected together by some circuit ... technique.  
♦ processing ♦ assembly ♦ manipulation
4. The transistor consists of a small piece of a ... with three electrodes.  
♦ diode ♦ conductor ♦ semiconductor
5. Modern ... began in the early 20<sup>th</sup> century with the invention of electronic tubes.  
♦ miniaturization ♦ electronics ♦ microelectronics
6. John Fleming was the ... of the first two-electrode vacuum tube.

♦ generator ♦ receiver ♦ inventor

7. One of the transistor advantages was lower power ... in comparison with vacuum tubes.

♦ consumption ♦ reception ♦ transmission

8. Microelectronics greatly extended man's intellectual ... .

♦ subsystems ♦ capabilities ♦ dimensions

### ***VII. Translate the following sentences into English:***

1. 16 декабря 1947 года ученым научно-исследовательского центра Bell Labs удалось создать действующий образец одного из самых великих изобретений двадцатого столетия – транзистора.

2. Транзистор – это полупроводниковый прибор для усиления, генерирования и преобразования электрических колебаний.

3. В 1948 г. американские учёные Бардин и Браттейн создали германиевый точечный триод (транзистор).

4. Аппаратура 40-х годов использовала для усиления, преобразования и коммутации сигналов в абонентских цепях два основных элемента: электронную лампу и электромеханическое реле.

5. Эти элементы были громоздки, срабатывали медленно, потребляли много энергии и не отличались высокой надежностью.

6. Bell нуждались в названии устройства. Предлагались названия «полупроводниковый триод» (semiconductor triode), «Solid Triode», «Surface States Triode», «кристаллический триод» (crystal triode) и «Iotatron», но слово «транзистор» (transistor), предложенное Джоном Пирсом (John R. Pierce), победило во внутреннем голосовании.

### ***VIII. Make presentation on the development of semiconductor transistors and their present-day usage.***

**Unit 8**  
**The UNIVAC Computer (and its creators,**  
**J. Presper Eckert and John Mauchly)**

***I. Pre-reading task.***

1. Do you remember the names of Dr. Presper Eckert and Dr. John Mauchly from Unit 5?
2. What was the name of the computer they created?
3. What problem did they have when they wanted to patent their invention?

***II. Read the text and check your answers.***

The Universal Automatic Computer or UNIVAC was a computer milestone achieved by Dr. Presper Eckert and Dr. John Mauchly, the team that invented the ENIAC computer.

J Presper Eckert and John Mauchly, after leaving the academic environment of The Moore School of Engineering to start their own computer business, found their first client was the United States Census Bureau. The Bureau needed a new computer to deal with the exploding U.S. population (the beginning of the famous baby boom). In April 1946, a \$300,000 deposit was given to Eckert and Mauchly for the research into a new computer called the UNIVAC.

*UNIVAC Computer*

The research for the project proceeded badly, and it was not until 1948 that the actual design and contract was finalized. The Census Bureau's ceiling for the project was \$400,000. J Presper Eckert and John Mauchly were prepared to absorb any overrun in costs in hopes of recouping from future service contracts, but the economics of the situation brought the inventors to the edge of bankruptcy.

In 1950, Eckert and Mauchly were bailed out of financial trouble by Remington Rand Inc. (manufacturers of electric razors), and the "Eckert-Mauchly

Computer Corporation" became the "Univac Division of Remington Rand." Remington Rand's lawyers unsuccessfully tried to re-negotiate the government contract for additional money. Under threat of legal action, however, Remington



Rand had no choice but to complete the UNIVAC at the original price.

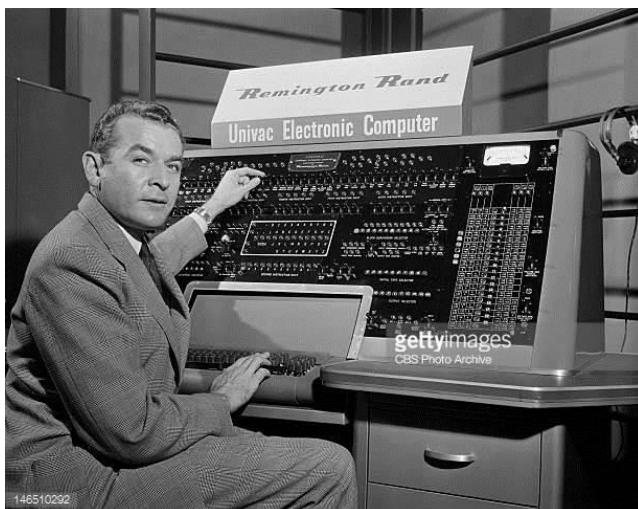
On March 31, 1951, the Census Bureau accepted delivery of the first UNIVAC computer. The final cost of constructing the first UNIVAC was close to one million dollars. Forty-six

UNIVAC computers were built for both government and business uses. Remington Rand became the first American manufacturers of a commercial computer system. Their first non-government contract was for General Electric's Appliance Park facility in Louisville, Kentucky, who used the UNIVAC computer for a payroll application.

### *UNIVAC SPECS.*

The UNIVAC had an add time of 120 microseconds, multiply time of 1,800 microseconds and a divide time of 3,600 microseconds.

Input consisted of magnetic tape with a speed of 12,800 characters per second with a read-in speed of 100 inches per second, records at 20 characters per inch, records at 50 characters per inch, card to tape converter 240 cards per minute, 80 column punched card input 120 characters per inch, and punched paper tape to magnetic tape converter 200 characters a second. Output media/speed was magnetic



tape/12,800 characters per second, uniprinter/10-11 characters per second, high speed printer/600 lines per minute, tape to card converter/120 cards per minute, Rad Lab buffer

storage/Hg 3,500 microsecond, or 60 words per minute.

J Presper Eckert and John Mauchly's UNIVAC was a direct competitor with IBM's computing equipment for the business market. The speed with which UNIVAC's magnetic tape could input data was faster than IBM's punch card technology, but it was not until the presidential election of 1952 that the public accepted the UNIVAC's abilities.

In a publicity stunt, the UNIVAC computer was used to predict the results of the Eisenhower-Stevenson presidential race. The computer had correctly predicted that Eisenhower would win, but the news media decided to blackout the computer's prediction and declared that the UNIVAC had been stumped. When the truth was revealed, it was considered amazing that a computer could do what political forecasters could not, and the UNIVAC quickly became a household name. The original UNIVAC now sits in the Smithsonian Institution.

<http://inventors.about.com/library/weekly/aa062398.htm>

***III. Translate the sentences from English into Russian paying attention to the words in bold type:***

1. **It was not until** 1948 **that** the actual design and contract was finalized.
2. Forty-six UNIVAC computers were built for **both** government **and** business uses.
3. **It was not until** the presidential election of 1952 **that** the public accepted the UNIVAC's abilities.

***IV. Translate the word-combinations from English into Russian:***

- 1) a computer milestone;
- 2) to deal (with)
- 3) research into a new computer;
- 4) ceiling for the project;
- 5) bring to the edge of bankruptcy;
- 6) to use the computer for a payroll application;
- 7) add / multiply / divide time;
- 8) magnetic tape;
- 9) card to tape converter;
- 10) punched paper tape;
- 11) buffer storage ;
- 12) a direct competitor;
- 13) to input data.



***V. Fill in the gaps in the following sentences:***

1. The UNIVAC computer was a ... .. achieved by Dr. Presper Eckert and Dr. John Mauchly who had invented the ENIAC computer .
2. The Bureau needed a new computer to ... .. the exploding U.S. population (the beginning of the famous baby boom).
3. The ... for the project proceeded badly.
4. In 1950, Eckert and Mauchly were ... out of financial trouble by Remington Rand Inc.
5. Remington Rand became the first American manufacturers of a commercial ... ..
6. The UNIVAC had an ... time of 120 microseconds, ... time of 1,800 microseconds and a ... time of 3,600 microseconds.
7. Input consisted of magnetic tape with a speed of 12,800 ... per second.
8. UNIVAC was a direct ... with IBM's computing equipment for the business market.
9. The UNIVAC computer was used to ... the results of the Eisenhower-Stevenson presidential race.
10. When the truth was revealed, it was considered amazing that a computer could do what political ... could not, and the UNIVAC quickly became a ... name.

***VI. Answer the following questions:***

1. Why do you think the creation of UNIVAC was called a computer milestone?
2. Why did the United States Census Bureau need a new computer in 1946?
3. How many years did it take to construct the UNIVAC computer? What was the final cost of the first machine?

4. How many UNIVAC computers were built for government and business uses?
5. Which company was the first non-government contract made with?
6. What can you say about UNIVAC specifications?
7. Which company was direct competitor with UNIVAC?
8. When did the public accept the UNIVAC abilities?
9. What was the UNIVAC's prediction for the Eisenhower-Stevenson presidential race?
10. Where is the original UNIVAC kept nowadays?

***VII. Make up a plan to the text and render the text according to the plan.  
Try to use grammar patterns given in Exercise 1 and vocabulary from  
Exercise 2.***

***VIII. Remember at least three things that UNIVAC is famous for.***

## MODULE 4.

### Third Generation Computers (1964-1971)

*I. Pre-reading task. Do you think the following statements true or false? Read the text to check your answer.*

- 1) IC wasn't used instead of transistors in the third generation computers.
- 2) Third generation computers were smaller in size but more expensive as compare to the second generation computers.
- 3) They were slow and more reliable.
- 4) High level language wasn't developed.
- 5) Magnetic core and solid states were used as main storage.
- 6) They were able to reduce computational time and had low maintenance cost.
- 7) Input/ Output devices became more uncomplicated.

#### *II. Put questions to the underlined phrases:*

During the period of 1964 to 1971 Third generation computers were developed. The third generation computers emerged with the development of IC (Integrated Circuits). The invention of the IC was the greatest achievement done in the period of third generation of computers. IC was invented by Robert Noyce and Jack Kilby in 1958-59. IC is a single component containing a number of transistors. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. Keyboards and monitors were developed during the period of third generation of computers. The third generation computers interfaced with an operating system, which allowed the device to run many different applications at one time with a central program that monitored the memory. PDP-8, PDP-11, ICL 2900, IBM 360 and IBM 370 are the examples of third generation computers.

<http://latesttechnomanias.blogspot.ru/2010/06/third-generation-computers.html>

### ***III. What are the advantages and disadvantages of third generation computers?***

You can use this source to get ready for this task.

Advantages and disadvantages of third generation computers: <http://www.physics-and-radio-electronics.com/computer-basics/generations-of-computer/third-generation.html>

### ***IV. Match the halves of the sentences:***

<b>1.</b>	The third generation was brought about	<b>A</b>	such as C, Pascal, COBOL and FORTRAN were gaining widespread use.
<b>2.</b>	Scientists and engineers were able to make transistors smaller and smaller,	<b>B</b>	used by the computer came to be purely electronic
<b>3.</b>	Well-known computers in this generation include the DEC PDP series	<b>C</b>	and manipulated, but the information vanished as soon as the power was lost.
<b>4.</b>	Suddenly computers became more affordable, and soon programmers and technology enthusiasts became more numerous,	<b>D</b>	by advances in the manufacture of transistors.
<b>5.</b>	It was during this time that many high-level programming languages	<b>E</b>	in the appropriate pattern to store the data, the pattern persisted, and could be stored off-line and read back into the computer years later.
<b>6.</b>	Processing and short-term memory for "work in progress"	<b>F</b>	which led to entire circuits fitting onto a single piece of silicon, now known as the integrated circuit or microchip.
<b>7.</b>	Because electronic circuits used no mechanical components, data could	<b>G</b>	leading to further developments in the field of computer programming as

	be very rapidly moved		well as in computer hardware.
8.	Magnetic media rather than electronics came to be used for long term storage, because once the media was magnetized	<b>H</b>	and the IBM-360 series computers.

***V. Render the following text in English:***

**Key words**

Electronic circuit

Interacting

Semiconductor

Photomask

Cathode beam

Varnish

Solvent

Alloying

Etching

outlet

**Краткое описание процесса изготовления микросхем.**

Разработчики с помощью компьютера создают электрическую схему новой микросхемы. Для этого они вводят в компьютер перечень свойств, которыми должна обладать микросхема, а компьютер с помощью специальной программы разрабатывает детальную структуру соединений и конструкций всех взаимодействующих элементов микросхемы.

Компьютер создаёт схемы расположения элементов на поверхности полупроводникового кристалла кремния. По этим схемам изготавливаются фотошаблоны — стеклянные пластинки со штриховым рисунком. Через фотошаблоны специальными лампами или источниками рентгеновского излучения, а иногда, и электронными пучками, освещают (засвечивают)

нанесённый на поверхность кристалла кремния слой фото- или, соответственно, рентгеночувствительного лака.

Засвеченные (или, наоборот, незасвеченные) участки лака меняют свои свойства и удаляются специальными растворителями. Этот процесс называется травлением. Вместе с лаком с поверхности кристалла кремния удаляется и слой окисла, и эти места становятся доступными для легирования — внедрения в кристаллическую решётку кремния атомов бора или фосфора. Легирование обычно требует нагрева пластинки в парах нужного элемента до 1100 — 1200 °С.

Последовательно меняя шаблоны и повторяя процедуры травления и легирования, создают один за другим слои будущей микросхемы. При этом на одной пластинке кристалла кремния создаётся множество одинаковых микросхем.

Каждая микросхема проверяется на работоспособность. Негодные выбраковываются.

После завершения всех операций пластинки нарезаются на отдельные кристаллики с микросхемами, к ним присоединяют выводы и устанавливают в корпуса.

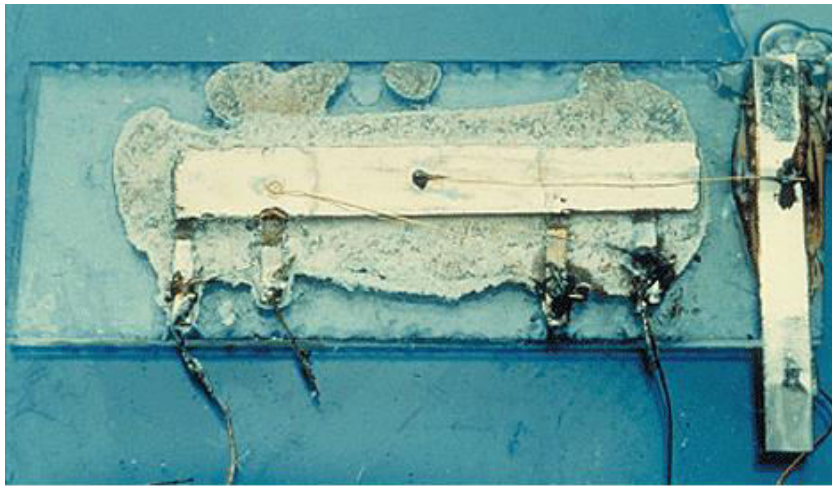
## Unit 9

### The History of the Integrated Circuit and Microchip

#### ***I. Pre-reading task:***

1. Do you know who Jack Kilby is?
2. Read J.Kilby's words and say what you think about his words.

*"What we didn't realize then was that the integrated circuit would reduce the cost of electronic functions by a factor of a million to one, nothing had ever done that for anything before" - Jack Kilby.*



**the first integrated circuit, 12.09.1958 by Jack Kilby**

#### ***II. Read the text using the dictionary if necessary.***

It seems that the integrated circuit was destined to be invented. Two separate inventors, unaware of each other's activities, invented almost identical integrated circuits or ICs at nearly the same time.

Jack Kilby, an engineer with a background in ceramic-based silk screen circuit boards and transistor-based hearing aids, started working for Texas Instruments in 1958. A year earlier, research engineer Robert Noyce had co-founded the Fairchild Semiconductor Corporation. From 1958 to 1959, both

electrical engineers were working on an answer to the same dilemma: how to make more of less.

In designing a complex electronic machine like a computer it was always necessary to increase the number of components involved in order to make technical advances. The monolithic (formed from a single crystal) integrated circuit placed the previously separated transistors, resistors, capacitors and all the connecting wiring onto a single crystal (or 'chip') made of semiconductor material. Kilby used germanium and Noyce used silicon for the semiconductor material.

In 1959 both parties applied for patents. Jack Kilby and Texas Instruments received U.S. patent #3,138,743 for miniaturized electronic circuits. Robert Noyce and the Fairchild Semiconductor Corporation received U.S. patent #2,981,877 for a silicon based integrated circuit. The two companies wisely decided to cross license their technologies after several years of legal battles, creating a global market now worth about \$1 trillion a year.

In 1961 the first commercially available integrated circuits came from the Fairchild Semiconductor Corporation. All computers then started to be made using chips instead of the individual transistors and their accompanying parts. Texas Instruments first used the chips in Air Force computers and the Minuteman Missile in 1962. They later used the chips to produce the first electronic portable calculators. The original IC had only one transistor, three resistors and one capacitor and was the size of an adult's pinkie finger. Today an IC smaller than a penny can hold 125 million transistors.

Jack Kilby holds patents on over sixty inventions and is also well known as the inventor of the portable calculator (1967). In 1970 he was awarded the National Medal of Science. Robert Noyce, with sixteen patents to his name, founded Intel, the company responsible for the invention of the microprocessor, in 1968. But for both men the invention of the integrated circuit stands historically as one of the most important innovations of mankind. Almost all modern products use chip technology.

<http://inventors.about.com/library/weekly/aa080498.htm>

***III. Answer the following questions:***



1. Who invented integrated circuits (ICs)?
2. Why was the integrated circuit needed?
3. What was used to perform functions of ICs in computer?
4. Explain the difference between Kilby's and Noyce's inventions?
5. When did the first commercially available integrated circuit appear?
6. What were the characteristics of original ICs?
7. Where were they used?
8. What is the size and features of modern IC?
9. What other J.Kilby's inventions do you know?
10. What can you tell about Robert Noyce's further career?

***IV. What do these numbers refer to? Do not use the text.***

1967, 1968, 125, 1970, #2,981,877, 1958 to 1959, #3,138,743

***V. Give Russian equivalents to the following words and word phrases:***

1) Integrated circuit; 2) to be destined; 3) ceramic-based silk screen; 4) transistor-based hearing aids; 5) monolithic; 6) to be worth; 7) accompanying parts; 8) portable.

***VI. Give synonyms to the following words:***

To reduce, separate, to be aware, background, dilemma, to increase, to receive, mankind.

***VII. Form nouns from these verbs, using the suffixes –er, -or, -tion, -sion, -ment.***

***Consult the dictionary and the text.***

To control, to invent, to achieve, to produce, to resist, to decide, to accomplish, to transmit, to manufacture, to prepare, to equip, to improve, to consume, to move, to invest.

***VIII. Give a written translation of the text, paying attention to computer science terminology.***

## MODULE 5

### Fourth generation computers (1971-Present)

#### *I. Pre-reading task. Do you think the following statements are true or false?*

- 1) The fourth generation computers don't have microprocessor-based systems.
- 2) They are the least cheap among all the computer generation.
- 3) The speed, accuracy and reliability of the computers were improved in fourth generation computers.
- 4) Many high-level languages were developed in the fourth generation such as COBOL, FORTRAN, BASIC, PASCAL and C language.
- 5) A further refinement of input/output devices was developed.
- 6) Networking between the systems hasn't been developed.

#### *II. Read the text to check your answers.*

After 1971 the fourth generation computers were built. The fourth generation computers were the extension of third generation technology. The fourth generation computers emerged with development of the VLSI (Very Large Scale Integration). With the help of VLSI technology microprocessor came into existence. The computers were designed by using microprocessor, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. The fourth generation computers became more powerful, compact, reliable and affordable. As a result, they give rise to personal computer (PC) revolution. For the first time in 1981 IBM introduced its computer for the home user and in 1984 Apple introduced the Macintosh Microprocessor. IBM 4341, DEC 10, STAR 1000, PUP 11 and APPLE II are the examples of fourth generation computers.

After the integrated circuits, the only place to go was down - in size, that is Large scale integration (LSI) could fit hundreds of components onto one chip. By

the 1980's, very large scale integration (VLSI) squeezed hundreds of thousands of components onto a chip. Ultra-large scale integration (ULSI) increased that number into the millions. The ability to fit so much onto an area about half the size of a U.S. dime helped diminish the size and price of computers. It also increased their power, efficiency and reliability. The Intel 4004 chip, developed in 1971, took the integrated circuit one step further by locating all the components of a computer (central processing unit, memory, and input and output controls) on a minuscule chip. Whereas previously the integrated circuit had had to be manufactured to fit a special purpose, now one microprocessor could be manufactured and then programmed to meet any number of demands. Soon everyday household items such as microwave ovens, television sets and automobiles with electronic fuel\_injection incorporated microprocessors.

Such condensed power allowed everyday people to harness a computer's power. They were no longer developed exclusively for large business or government contracts. By the mid-1970's, computer manufacturers sought to bring computers to general consumers. These minicomputers came complete with user-friendly software packages that offered even non-technical users an array of applications, most popularly word processing and spreadsheet programs. Pioneers in this field were Commodore, Radio Shack and Apple Computers. In the early 1980's, arcade video games such as Pac Man and home video game systems such as the Atari 2600 ignited consumer interest for more sophisticated, programmable home computers.

In 1981, IBM introduced its personal computer (PC) for use in the home, office and schools. The 1980's saw an expansion in computer use in all three arenas as clones of the IBM PC made the personal computer even more affordable. The number of personal computers in use more than doubled from 2 million in 1981 to 5.5 million in 1982. Ten years later, 65 million PCs were being used. Computers continued their trend toward a smaller size, working their way down from desktop to laptop computers (which could fit inside a briefcase) to palmtop (able to fit inside a breast pocket). In direct competition with IBM's PC was

Apple's Macintosh line, introduced in 1984. Notable for its user-friendly design, the Macintosh offered an operating system that allowed users to move screen icons instead of typing instructions. Users controlled the screen cursor using a mouse, a device that mimicked the movement of one's hand on the computer screen.

As computers became more widespread in the workplace, new ways to harness their potential developed. As smaller computers became more powerful, they could be linked together, or networked, to share memory space, software, information and communicate with each other. As opposed to a mainframe computer, which was one powerful computer that shared time with many terminals for many applications, networked computers allowed individual computers to form electronic co-ops. Using either direct wiring, called a Local Area Network (LAN), or telephone lines, these networks could reach enormous proportions. A global web of computer circuitry, the Internet, for example, links computers worldwide into a single network of information. During the 1992 U.S. presidential election, vice-presidential candidate Al Gore promised to make the development of this so-called "information superhighway" an administrative priority. Though the possibilities envisioned by Gore and others for such a large network are often years (if not decades) away from realization, the most popular use today for computer networks such as the Internet is electronic mail, or E-mail, which allows users to type in a computer address and send messages through networked terminals across the office or across the world.

<http://inventors.about.com/library/weekly/aa051599.htm>

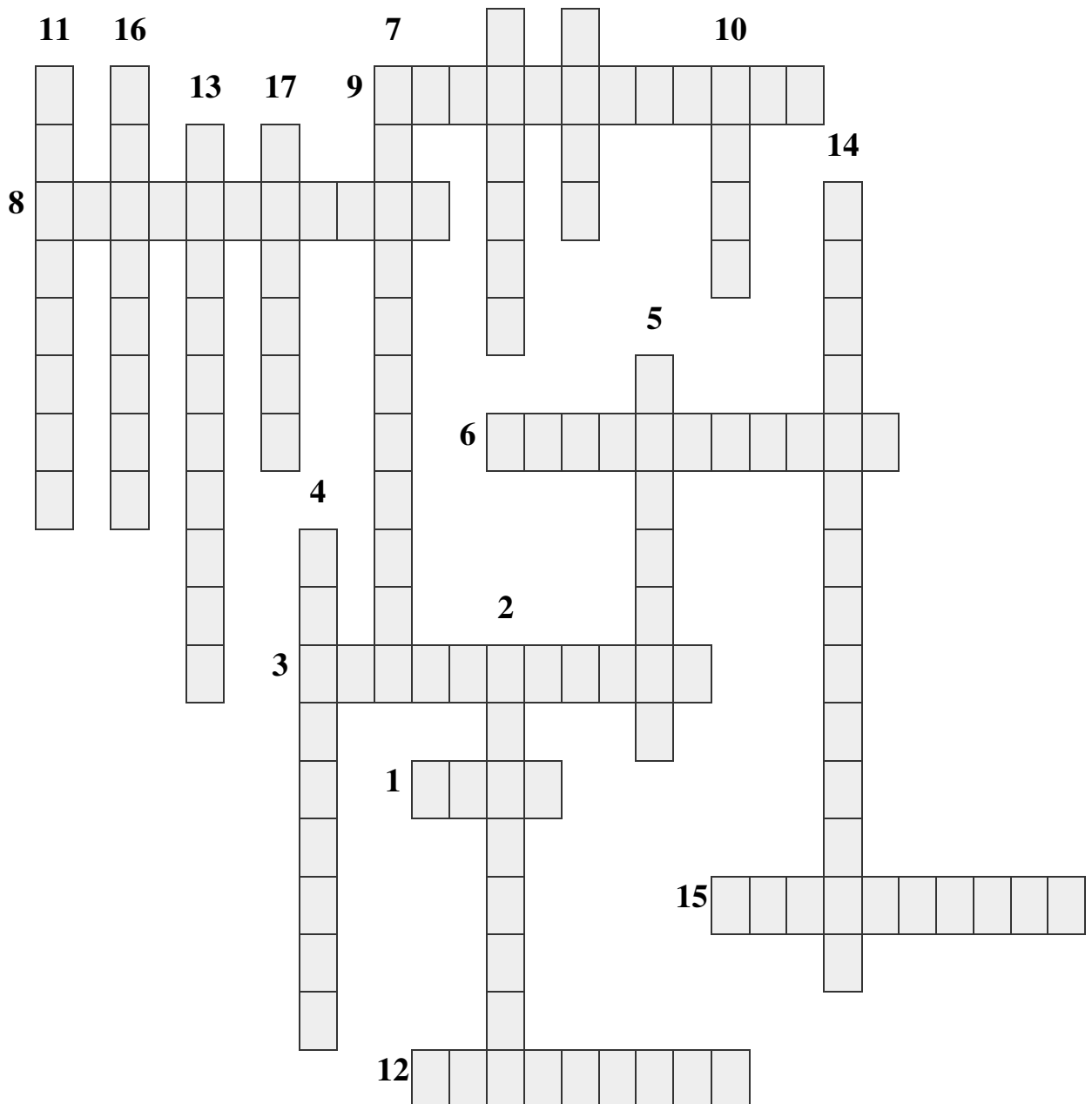
***III. 1. Read every paragraph carefully and write down 4-5 words which help to understand the main idea of the paragraph.***

***2. Render the whole text using the words.***

***IV. Answer the following questions:***

1. What is the difference between computers of the fourth generation and its forerunners?
2. What helped to reduce the size and the price of computers?
3. What household appliances incorporated microprocessors?
4. What kind of software did the fourth generation of PCs offer?
5. How did IBM change its computers in 1980s?

***V. Crossword.***



***Across***

1. inner surface of the hand
3. the combining of two or more things so that they work together efficiently.
6. computer program designed to perform a specific task
8. act or process of making a product by hand or by machine
9. telecommunication infrastructure or system used for widespread and usually rapid access to information
15. financially manageable
12. activation of a device

***Down***

2. credible, trustworthy, dependable
4. computer used primarily by large organizations for critical applications, bulk data processing
5. nonmetallic element used in the manufacture of metal alloys and electronic components
7. an interactive computer application for organization, analysis and storage of data in tabular form
10. metal strand, cord, line
11. make/become smaller, reduce
13. an ability to avoid wasting materials, energy, efforts, money and time in doing something or in producing a desired result.
14. integrated circuit that performs the central processing and internal functions of a computer
16. a person or organization that uses economic services or commodities
17. part of a television or computer monitor where the picture is displayed

## Unit 10

### Intel 4004 - The World's First Single Chip Microprocessor

#### *I. Answer the following questions before you study the text below:*

1. Do you know why the name Intel was chosen?
2. Why computer inventions, e.g. Intel 4004, include numbers in their names?

#### *II. Read the text using the dictionary if necessary.*

In November, 1971, a company called Intel publicly introduced the world's first single chip microprocessor, the Intel 4004 (U.S. Patent #3,821,715), invented by Intel engineers Federico Faggin, Ted Hoff, and Stan Mazor. After the invention of integrated circuits revolutionized computer design, the only place to go was down – in size that is. The Intel 4004 chip took the integrated circuit down one step further by placing all the parts that made a computer think (i.e. central processing unit, memory, input and output controls) on one small chip. Programming intelligence into inanimate objects had now become possible.

(1) In 1968, Bob Noyce and Gordon Moore were two unhappy engineers working for the Fairchild Semiconductor Company who decided to quit and create their own company at a time when many Fairchild employees were leaving to create start-ups. People like Noyce and Moore were nicknamed the "Fairchildren".

Bob Noyce typed himself a one-page idea of what he wanted to do with his new company, and that was enough to convince San Francisco venture capitalist Art Rock to back Noyce's and Moore's new venture. Rock raised \$2.5 million dollars in less than 2 days.

(2) The name "Moore Noyce" was already trademarked by a hotel chain, so the two founders decided upon the name "Intel" for their new company, a shortened version of "Integrated Electronics".

Intel's first money making product was the 3101 Schottky bipolar 64-bit static random access memory (SRAM) chip.

(3) In late 1969, a potential client from Japan called Busicom, asked to have twelve custom chips designed. Separate chips for keyboard scanning, display control, printer control and other functions for a Busicom-manufactured calculator.

Intel did not have the manpower for the job but they did have the brainpower to come up with a solution. Intel engineer, Ted Hoff decided that Intel could build one chip to do the work of twelve. Intel and Busicom agreed and funded the new programmable, general-purpose logic chip.

Federico Faggin headed the design team along with Ted Hoff and Stan Mazor, who wrote the software for the new chip. Nine months later, a revolution was born. At 1/8th inch wide by 1/6th inch long and consisting of 2,300 MOS (metal oxide semiconductor) transistors, the baby chip had as much power as the ENIAC, which had filled 3,000 cubic feet with 18,000 vacuum tubes.

Cleverly, Intel decided to buy back the design and marketing rights to the 4004 from Busicom for \$60,000. The next year Busicom went bankrupt, they never produced a product using the 4004. Intel followed a clever marketing plan to encourage the development of applications for the 4004 chip, leading to its widespread use within months.

(4) The 4004 was the world's first universal microprocessor. In the late 1960s, many scientists had discussed the possibility of a computer on a chip, but nearly everyone felt that integrated circuit technology was not yet ready to support such a chip. Intel's Ted Hoff felt differently; he was the first person to recognize that the new silicon-gated MOS technology might make a single-chip CPU (central processing unit) possible.

Hoff and the Intel team developed such an architecture with just over 2,300 transistors in an area of only 3 by 4 millimetres. With its 4-bit CPU, command register, decoder, decoding control, control monitoring of machine commands and interim register, the 4004 was one heck of a little invention. Today's 64-bit microprocessors are still based on similar designs, and the microprocessor is still the most complex mass-produced product ever with more than 5.5 million



transistors performing hundreds of millions of calculations each second – numbers that are sure to be outdated fast.

<http://inventors.about.com/library/weekly/aa092998.htm>

**III. Give Russian equivalents to the following words and word combinations:**

1) Single chip microprocessor; 2) central processing unit (CPU); 3) input and output controls; 4) inanimate objects; 5) to create start-ups; 6) to trademark; 7) 64-bit static random-access memory; 8) general-purpose logic chip 9) silicon-gated metal oxide semiconductor (MOS); 10) command register; 11) interim register.

**IV. Give antonyms to the following words:**

Quit, employee, raise, outdated, mass-produced, encourage, potential, go bankrupt.

**V. Give synonyms to the following words:**

Widespread, to convince, solution, to back, similar, complex, to perform, to head.

**VI. Answer the following questions:**

1. When was the first single-chip microprocessor introduced? Who invented it?
2. What were innovations of Intel 4004 chip?
3. Who were “Fairchildren”? Why were they called so?
4. How did Noyce and Moore manage to get money for their new venture?
5. Why was the new company called Intel?
6. What was Intel’s first money making project?
7. How did engineers get the idea of Intel 4004?
8. What were the features of the new chip?
9. Can you explain how Intel got back its rights to the 4004 from Busicom?
10. How did the company gain from it?

***V. For each part (1)-(4) choose a title A-D which best fits its meaning.***

- A. The History of Intel
- B. The Intel 4004 Microprocessor
- C. One Chip Does the Work of Twelve
- D. Intel Trademark.

***VI. Give the contents of each part in 2-3 sentences.***

## **Unit 11**

### **The History of the IBM PC**

***I. Pre-reading task. Answer the following questions:***

1. What does IBM stand for?
2. What do you know about IBM PC?

***II. Read the text and check your answers.***

In July of 1980, IBM representatives met for the first time with Microsoft's Bill Gates to talk about writing an operating system for IBM's new hush-hush "personal" computer. IBM had been observing the growing personal computer market for some time. They had already made one dismal attempt to crack the market with their IBM 5100.

IBM 5100 was a complete system, with a built-in monitor, keyboard, and data storage. It was also very expensive – up to US\$20,000. It was specifically designed for professional and scientific problem-solvers, not business users or hobbyists. When the PC was introduced in 1981, it was originally designated as the IBM 5150, putting it in the "5100" series, though its architecture wasn't directly descended from the IBM 5100.

At one point, IBM considered buying the fledgling game company Atari to commandeer Atari's early line of personal computers. However, IBM decided to stick with making their own personal computer line and developed a brand new operating system to go with. The secret plans were referred to as "Project Chess". The code name for the new computer was "Acorn". Twelve engineers directed by Don Estridge assembled in Boca Raton, Florida, to design and build the "Acorn".

They developed the PC in about a year. To achieve this, they first decided to build the machine with "off-the-shelf" parts from a variety of different original equipment manufacturers (OEMs) and countries. Previously IBM had always developed their own components. Secondly for scheduling and cost reasons, rather than developing unique IBM PC monitor and printer designs, project management decided to utilize an existing "off-the-shelf" IBM monitor developed earlier in IBM Japan as well as an existing Epson printer model. They also decided on an open architecture, so that other manufacturers could produce and sell peripheral components and compatible software without purchasing licenses.

On August 12, 1981, IBM released their new computer, re-named the IBM PC. The "PC" stood for "personal computer" making IBM responsible for popularizing the term "PC".

Alongside "microcomputer" and "home computer", the term "personal computer" was already in use before 1981. It was used as early as 1972 to characterize Xerox PARC's Alto. However, because of the success of the IBM Personal Computer, the term came to mean more specifically a microcomputer compatible with IBM's PC products.

The first IBM PC ran on a 4.77 MHz Intel 8088 microprocessor. The PC came equipped with 16 kilobytes of memory, expandable to 256k. The PC came with one or two 160k floppy disk drives and an optional color monitor. The price tag started at \$1,565, which would be nearly \$4,000 today. What really made the IBM PC different from previous IBM computers was that it was the first one built from off the shelf parts (called open architecture) and marketed by outside

distributors (Sears & Roebucks and Computerland). The Intel chip was chosen because IBM had already obtained the rights to manufacture the Intel chips. IBM had used the Intel 8086 for use in its Displaywriter Intelligent Typewriter in exchange for giving Intel the rights to IBM's bubble memory technology.

Less than four months after IBM introduced the PC, Time Magazine named the computer "man of the year".

<http://inventors.about.com/library/weekly/aa031599.htm>

**III. Give Russian equivalents to the following words and word combinations:**

1) Hush-hush "personal" computer; 2) to crack the market; 3) scientific problem-solvers; 4) to be (originally) designated; 5) to descend from; 6) to stick with smth.; 7) to be referred to; 8) "off-the-shelf" parts; 9) compatible software; 10) expandable (to); 11) bubble memory technology.

**IV. Find synonyms in the text to the following words and word combinations:**

1) secret (adj); 2) scientific research makers; 3) to be called (as); 4) to be supervised (by); 5) ready-made parts; 6) producers; 7) to make use of smth; 8) to buy (a licence); 9) smth which can be expanded; 10) to get (the rights).

**V. Fill in the gaps in the following sentences:**

1. In July, 1980 IBM representatives met Bill Gates to talk about writing an ...  
... for IBM's new hush-hush "personal" computer.
2. IBM 5100 was a complete system, with a ... .. monotor, keyboard, and data storage.
3. IBM 5100 specifically ...for professional and scientific problem-solvers, not business ...or hobbyists.
4. However, IBM decided to ... .. making their own personal computer line.
5. The secret plans were ... to as "Project Chess".

6. To develop the computer in a short time, they decided to build the machine with "... .. ." parts.
7. The "PC" stood for "personal computer" making IBM ... for popularizing the term "PC".
8. Because of the ... of the IBM Personal Computer, the term PC came to mean more specifically a ... compatible with IBM's PC products.
9. The PC came with one or two 160k ...disk drives and an ... color monitor.
10. What really made the IBM PC different from ...IBM computers was that it was the first one built from off the ... parts (called open architecture).

***VI. Answer the following questions:***

1. Why were plans of creating a new IBM computer kept in secret?
2. What was the code name for the new computer?
3. What can you say about IBM 5100?
4. Where did twelve engineers directed by Don Estridge get together to create the new model?
5. How long did it take them to develop the IBM PC?
6. What kind of parts did they decide to build the machine and why?
7. What does "open architecture" mean?
8. When was the IBM PC released?
9. When was the term PC first used?
10. What were the IBM PC's specifications?
11. What really made the IBM PC different from previous IBM computers?
12. Why was the Intel chip chosen?
13. What memorable event happened four months after IBM introduced the PC?

***VII. Render the text using the questions in previous exercise as a plan of the text.***

## Unit 12

### The Invention of the Apple Macintosh

#### *I. Pre-reading task.*

1. Who were the inventors of the Apple Computers? Why did they choose such a name for the new computer?
2. What was special about marketing company of Apple Computers?

#### *II. Read the text and check your answers on pre-reading task.*

"Hello, I am Macintosh. Never trust a computer you cannot lift... I'm glad to be out of that bag" – talking Macintosh Computer.

In December, 1983, Apple Computers ran its' famous "1984" Macintosh television commercial, on a small unknown station solely to make the commercial eligible for awards during 1984. The commercial cost 1.5 million and only ran once in 1983, but news and talk shows everywhere replayed it, making TV history. The next month, Apple Computer ran the same ad during the NFL Super Bowl, and millions of viewers saw their first glimpse of the Macintosh computer. The commercial was directed by Ridley Scott, and the Orwellian scene depicted the IBM world being destroyed by a new machine, the "Macintosh".

Could we expect anything less from a company that was now being run by the former president of Pepsi-Cola. Steve Jobs, co-founder of Apple Computers had been trying to hire Pepsi's John Sculley since early 1983. In April of that year he succeeded. But Steve and John discovered that they did not get along and one of John Sculley's first actions as CEO of Apple was to boot Steve Jobs off the Apple "Lisa" project, the "Lisa" was the first consumer computer with a graphical user interface or GUI. Jobs then switched over to managing the Apple "Macintosh" project begun by Jeff Raskin. Jobs was determined that the new "Macintosh" was going to have a graphical user interface, like the "Lisa" but at a considerably lower cost.

Note: The early Mac team members (1979) consisted of Jeff Raskin, Brian Howard, Marc LeBrun, Burrell Smith. Joanna Hoffman and Bud Tribble. Others began working working on the Mac at later dates.

<b>Specifications</b>	<b>Macintosh 128K</b>
CPU:	MC68000
CPU speed:	8 Mhz
FPU:	None
RAM:	128k Dram not expandable
ROM:	64k
Serial Ports:	2
Floppy:	1 3.5" 400k
Monitor:	9" 512x384 square pixels built-in B/W
Power:	60 Watts
Weight:	16.5 lbs.
Dimensions:	13.6" H x 9.6" W x 10.9" D
System Software:	Mac OS 1.0
Production:	January 1984 to October 1985
Cost:	\$2,495

Seventy-four days after the introduction of the "Macintosh", 50,000 units had been sold, not that strong a show. Apple refused to license the OS or the hardware, the 128k memory was not enough and a single floppy was difficult to use. The "Macintosh" had "Lisa's" user friendly GUI, but initially missed some of the more powerful features of the "Lisa" like multitasking and the 1 MB of memory. Jobs

compensated by making sure developers created software for the new "Macintosh", Jobs figured that software was the way to win the consumer over.

In 1985, the "Macintosh" computer line received a big sales boost with the introduction of the LaserWriter printer and Aldus PageMaker, home desktop publishing was now possible. But 1985 was also the year when the original founders of Apple left the company.

Steve Wozniak returned to college and Steve Jobs was fired, his difficulties with John Sculley coming to a head. Jobs had decided, to regain control of the company away from Sculley, he scheduled a business meeting in China for Sculley and planned for a corporate take-over, when Sculley would be absent. Information about Jobs' true motives, reached Sculley before the China trip, he confronted Jobs and asked Apple's Board of Directors to vote on the issue. Everyone voted for Sculley and Jobs quit, in lieu of being fired. Jobs later rejoined Apple in 1996 and has happily worked there ever since. Sculley was eventually replaced as CEO of Apple.

<http://inventors.about.com/library/weekly/aa043099.htm>

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

1. How was advertising campaign for Macintosh computers launched?
2. What was the idea of television commercials for these computers? Was the commercial effective?
3. Who were the founders of Apple Computers?
4. What was "Lisa" project?
5. Why did Jobs didn't finish his work with "Lisa"?
6. Can you remember the names of early Mac team members?
7. What were the drawbacks of "Macintosh" in comparison with "Lisa"?
8. What changes took place in Apple company in 1985?  
Why did Jobs leave the company?



***IV. Give Russian equivalents to the following words and expressions:***

1) Eligible; 2) glimpse; 3) CEO; 4) to boot off; 5) FPU; 6) dimensions; 7) multitasking; 8) to receive a big sales boost; 9) home desktop publishing; 10) corporate take-over; 11) to confront; 12) to vote on the issue; 13) to quit.

***V. Guess what words from the text are meant by these definitions:***

- To plan or appoint for a certain time or date.
- A paid advertisement on television or radio.
- Alone, singly; entirely; exclusively.
- To manage to do what one is trying to do; to achieve one's aim or purpose.
- Firmly decided.
- Not present in a place or situation.
- To discharge from a position; dismiss.
- Instead of.

***VI. Translate the following sentences from Russian into English:***

1. История компании Apple началась тридцать лет назад, когда два друга Стив Джобс и Стив Возняк решили основать собственную компанию по производству и выпуску компьютеров.
2. В мае 1979 года сотрудник Apple Джеф Раскин начал работать над новым компьютером «все в одном», который был ориентирован на рядового пользователя. Именно этот период и можно назвать началом рождения первого Macintosh.
3. В 1983 году Apple выпустил Lisa – первый персональный компьютер с графическим пользовательским интерфейсом, названный так в честь дочери Джобса. Но из-за довольно высокой цены и ограниченного набора приложений эта модель не получила широкого распространения.

4. Самый первый свой Macintosh компания Apple официально представила 22 января 1984 года рекламным роликом «1984», основанным на сюжете книги Д. Оруэлла.
5. Когда Mac OS была впервые представлена в 1984 году, то для того времени она являла собой совершенство современного программирования. Операционные системы для других платформ, которые появились несколько лет спустя, предлагали такие вещи, как защищенная память и многозадачность, что в конечном итоге давало лучший пользовательский опыт.

***VII. Comment on the following Steve Jobs' quotes:***

- "The desktop computer industry is dead. Innovation has virtually ceased. Microsoft dominates with very little innovation. That's over. Apple lost. The desktop market has entered the dark ages, and it's going to be in the dark ages for the next 10 years, or certainly for the rest of this decade." (*Wired magazine*, February 1996).
- "It wasn't that Microsoft was so brilliant or clever in copying the Mac, it's that the Mac was a sitting duck for 10 years. That's Apple's problem: Their differentiation evaporated." (*Apple Confidential 2.0*)
- "I didn't see it then, but it turned out that getting fired from Apple was the best thing that could have ever happened to me. The heaviness of being successful was replaced by the lightness of being a beginner again, less sure about everything. It freed me to enter one of the most creative periods of my life." (Stanford University commencement address, June 12, 2005).

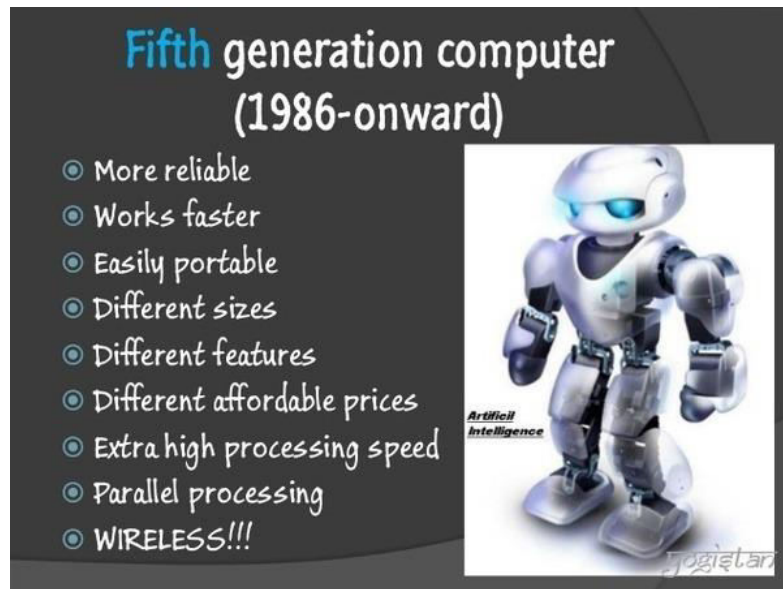
***VIII. Compare Apple Macintosh and Windows. Make a presentation about their advantages and disadvantages.***

## MODULE 6

### Fifth generation computers (Present and Beyond)

#### I. *Pre-reading task. Answer the following questions:*

1. Look at the picture below and try to guess what else is characteristic for fifth generation computers?



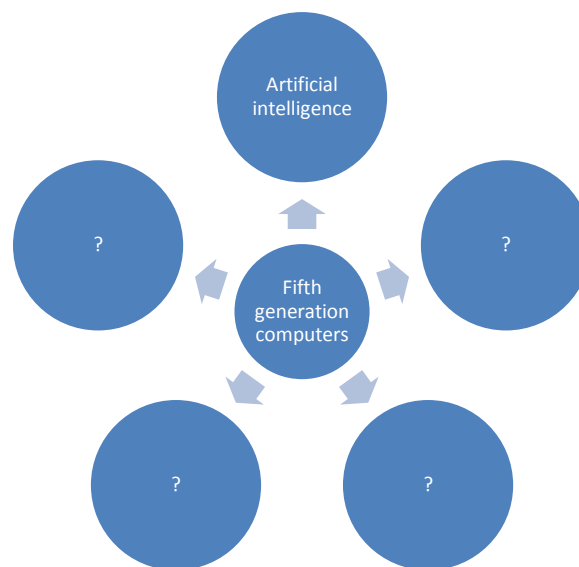
2. Can you think of some examples of fifth generation computers (existing ones, prototypes, featured in the films)?

#### II. *Read and translate the text. Having studied it, complete the diagram below.*

Fifth generation computers are in developmental stage which is based on the artificial intelligence. The goal of the fifth generation is to develop the device which could respond to natural language input and is capable of learning and self-organization. Quantum computation and molecular and nanotechnology will be used in this technology. So we can say that the fifth generation computers will have the power of human intelligence.

## Characteristics

- The fifth generation computers will use super large scale integrated chips.
- They will have artificial intelligence.
- They will be able to recognize image and graphs.
- Fifth generation computer aims to be able to solve highly complex problem including decision making, logical reasoning.
- They will be able to use more than one CPU for faster processing speed.
- Fifth generation computers are intended to work with natural language.



**III.** *To summarize the main idea complete the text using the words in the table*

Parallel, reality, artificial intelligence, development , superconductors, voice recognition

Fifth generation computing devices, based on ..., are still in ..., though there are some applications, such as..., that are being used today. The use of ... processing and ... is helping to make artificial intelligence a ....

## Unit 13

### Quantum computers

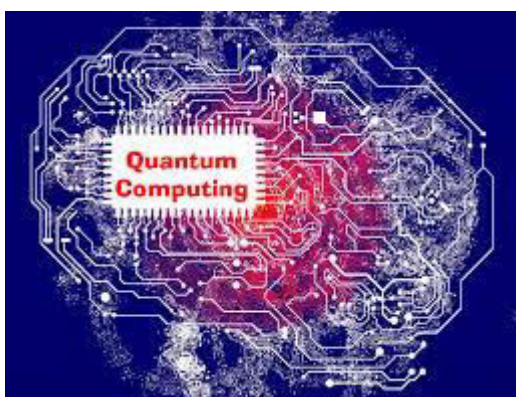
- I. Pre-reading task. Look at Jerry Chow's words quoted below, why do you think so many people are excited about it? Who is Jerry Chow?*

Quantum computing is exciting. It's coming, and we want a lot more people to be well-versed in it. (Jerry Chow)

- II. Read and translate the text.*

### Quantum computers are about to get real

A quantum computer is any device for computation that makes direct use of distinctively quantum mechanical phenomena, such as superposition and entanglement, to perform operations on data.



Quantum computers aren't putting standard computers to shame just yet, but if they can be scaled up, they could transcend current limits of computation. At present time the most advanced computers are working with fewer than two dozen qubits. But teams from industry and academia are working on expanding their own versions of quantum computers to 50 or 100 qubits, enough to perform certain calculations that the most powerful supercomputers can't pull off.

The race is on to reach that milestone, known as "quantum supremacy." Scientists should meet this goal within a couple of years, says quantum physicist David Schuster of the University of Chicago. "There's no reason that I see that it won't work."

But supremacy is only an initial step, a symbolic marker akin to sticking a flagpole into the ground of an unexplored landscape. The first tasks where quantum computers prevail will be contrived problems set up to be difficult for a standard computer but easy for a quantum one. Eventually, the hope is, the computers will become prized tools of scientists and businesses.

### Attention-getting ideas

Some of the first useful problems quantum computers will probably tackle will be to simulate small molecules or chemical reactions. From there, the computers could go on to speed the search for new drugs or kick-start the development of energy-saving catalysts to accelerate chemical reactions. To find the best material for a particular job, quantum computers could search through millions of possibilities to pinpoint the ideal choice, for example, ultrastrong polymers for use in airplane wings. Advertisers could use a quantum algorithm to improve their product recommendations — dishing out an ad for that new cell phone just when you're on the verge of purchasing one.

Quantum computers could provide a boost to machine learning, too, allowing for nearly flawless handwriting recognition or helping self-driving cars assess the flood of data pouring in from their sensors to swerve away from a child running into the street. And scientists might use quantum computers to explore exotic realms of physics, simulating what might happen deep inside a black hole, for example.

But quantum computers won't reach their real potential — which will require harnessing the power of millions of qubits — for more than a decade. Exactly what possibilities exist for the long-term future of quantum computers is still up in the air. Errors are a major obstacle to boosting quantum volume. With their delicate quantum properties, qubits can accumulate glitches with each operation. Qubits must resist these errors or calculations quickly become unreliable. Eventually,

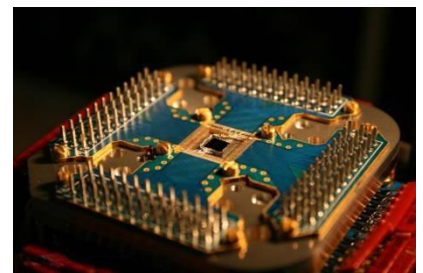
quantum computers with many qubits will be able to fix errors that crop up, through a procedure known as error correction. Still, to boost the complexity of calculations quantum computers can take on, qubit reliability will need to keep improving.

The outlook is similar to the patchy vision that surrounded the development of standard computers — which quantum scientists refer to as “classical” computers — in the middle of the 20th century. When they began to tinker with electronic computers, scientists couldn’t fathom all of the eventual applications; they just knew the machines possessed great power. From that initial promise, classical computers have become indispensable in science and business, dominating daily life, with handheld smartphones becoming constant companions.

Since the 1980s, when the idea of a quantum computer first attracted interest, progress has come in fits and starts. Without the ability to create real quantum computers, the work remained theoretical, and it wasn’t clear when — or if — quantum computations would be achievable. Now, with the small quantum computers at hand, and new developments coming swiftly, scientists and corporations are preparing for a new technology that finally seems within reach.

### Anatomy of a qubit

Quantum computing’s promise is rooted in quantum mechanics, the counterintuitive physics that governs tiny entities such as atoms, electrons and molecules. The basic element of a quantum computer is the qubit (pronounced “CUE-bit”). Unlike a standard computer bit, which can take on a value of 0 or 1, a qubit can be 0, 1 or a combination of the two — a sort of purgatory between 0 and 1 known as a quantum superposition.



When a qubit is measured, there's some chance of getting 0 and some chance of getting 1. But before it's measured, it's both 0 and 1.

Because qubits can represent 0 and 1 simultaneously, they can encode a wealth of information. In computations, both possibilities — 0 and 1 — are operated on at the same time, allowing for a sort of parallel computation that speeds up solutions.

Another qubit quirk: Their properties can be intertwined through the quantum phenomenon of entanglement. A measurement of one qubit in an entangled pair instantly reveals the value of its partner, even if they are far apart — what Albert Einstein called “spooky action at a distance.”

Such weird quantum properties can make for superefficient calculations. But the approach won't speed up solutions for every problem thrown at it. Quantum calculators are particularly suited to certain types of puzzles, the kind for which correct answers can be selected by a process called quantum interference. Through quantum interference, the correct answer is amplified while others are canceled out, like sets of ripples meeting one another in a lake, causing some peaks to become larger and others to disappear.

One of the most famous potential uses for quantum computers is breaking up large integers into their prime factors. For classical computers, this task is so difficult that credit card data and other sensitive information are secured via encryption based on factoring numbers. Eventually, a large enough quantum computer could break this type of encryption, factoring numbers that would take millions of years for a classical computer to crack.

Quantum computers also promise to speed up searches, using qubits to more efficiently pick out an information needle in a data haystack.



Qubits can be made using a variety of materials, including ions, silicon or superconductors, which conduct electricity without resistance. Unfortunately, none of these technologies allow for a computer that will fit easily on a desktop. Though the computer chips themselves are tiny, they depend on large cooling systems, vacuum chambers or other bulky equipment to maintain the delicate quantum properties of the qubits. Quantum computers will probably be confined to specialized laboratories for the foreseeable future, to be accessed remotely via the internet.

<https://www.sciencenews.org/article/quantum-computers-are-about-get-real>

**III. Give Russian equivalents to the words and word combinations below and explain their meaning in your own words.**

Distinctively, phenomena, superposition, entanglement, be scaled up, transcend, milestone, supremacy, akin to, prevail, contrived, tackle, kick-start, pinpoint, on the verge of, flawless, recognition, swerve away from, realms, harness, glitch, resist, crop up, patchy, tinker, fathom, eventual, indispensable, be within reach, purgatory, measure, quirk, approach, interference, amplify, ripple, integer, silicon, bulky, maintain, be confined to, remotely, for the foreseeable future.

**Choose 3-5 words that you find hard to memorize and use them in sentences of your own.**

**IV. Find synonyms for the following words from the text.**

Present, nowadays, sophisticated, carry put, specific (2 words), aim, first, finally, deal with, cause to move quickly (2 words), make smh commence, be about to, evaluate, mistake, main, obstruction, characteristics, repair, have, nearby,

be based on smth, very little, at the same time, immediately, disclose, strange, confidential, through, effectively.

**V. Explain the meaning of the following phrasal verbs and idiomatic expressions from the text.**

Put smth to shame, pull off, stick a flagpole into the ground of an unexplored landscape, reach one's real potential, be still up in the air, progress has come in fits and starts, pick out an information needle in a data haystack

**VI. Make 5-7 questions on the text and use them to check your groupmates' text comprehension.**

**VII. Discuss the following questions on quantum computing in the class.**

1. Why is it necessary to consider quantum computing?
2. What is a qubit?
3. Can quantum computers do what classical cannot?
4. Where do the differences between the classical and quantum information processing lie?
5. How did the idea of quantum computers appear?
6. What is the history of quantum computers?
7. What are the possible early applications of quantum computers?
8. Can quantum computers solve some practically important problems more efficiently?
9. Where does the power of quantum computing come from?
10. How do they test and measure qubits?
11. Why is it difficult to investigate qubits?
12. Where are the drawbacks and bottlenecks of quantum computing?
13. Can quantum computers eventually replace classical ones?

14. Give a brief description of major quantum-computer based projects (IBM, Google, Intel, Microsoft, D-Wave, Chris Monroe's project, etc.)
15. Why do companies like IBM are pushing their quantum computers to users via the Web?

**VIII. Watch the TED video where Jerry Chow talks about the future of supercomputers**

<https://www.ted.com/watch/ted-institute/ted-ibm/jerry-chow-the-future-of-supercomputers>

Summarize the speakers' main idea in 7-10 sentences. Read your summary in the class and choose the best one, which contains the main ideas and issues raised in the speech. Discuss Jerry Chow's main ideas in the class.

**IX. Study the presentation in the link; it will give you a better understanding of a cubit.**

[https://physicsandcake.files.wordpress.com/2010/02/qc\\_for\\_beginners.pdf](https://physicsandcake.files.wordpress.com/2010/02/qc_for_beginners.pdf)

**X. Search the Internet for additional information and the news related to quantum computing, make brief reports and present them in the class.**

## Unit 14

### Artificial intelligence

**I. Pre-reading task . Before you read answer the questions in pairs.**

1. Spend one minute writing down all of the different words you associate with the word "robot". Share your words with your partner(s) and talk about them. Together, put the words into different categories.
2. What is your favourite movie that features robots?

## ***II. Read the text to know more about AI.***

What is artificial intelligence? This is a legitimate question. We most certainly will develop neural networks that are intelligent before we develop nets that become conscious. So in attempting to create neural networks that are intelligent or demonstrate intelligence, what criteria should one use to determine if this goal has been achieved? Alan Turing, a British mathematician, devised an interesting procedural test that is generally accepted as a valid way to determine if a machine has intelligence. The test is conducted as follows: A person and the machine hold a conversation by typing messages to one another via a teletype. If the machine can carry on a conversation without the person being able to determine whether a machine or person exists at the other teletype, the machine can be classified as intelligent. This is called the Turing test and is one criteria used to determine AI. Although the Turing test is well accepted, it isn't a definitive test for AI. There are a number of "completely dumb" language processing programs that come close to passing the Turing test. The most famous program is named ELIZA, developed by Joseph Weizenbaum at the Massachusetts Institute of Technology (MIT). ELIZA simulates a psychologist, and you are able to conduct a conversation with ELIZA. For instance, if you typed to ELIZA that you missed your father, ELIZA might respond with "Why do you miss your father?" or "Tell me more about your father." These responses may lead you to believe that ELIZA understands what you have said. It doesn't. The responses are clever programming tricks constructed from your statements. Therefore, if we like, we could do away with the Turing test and consider a different criterion. Perhaps consciousness or selfawareness would be a better signpost of intelligence. A self-aware machine would certainly know that it is intelligent. Another criterion, more simple and direct is the ability to learn from experience. Of course, we could abandon logical approximations entirely and state that intelligence is achieved in systems that develop a sense of humor. As far

as I know humans are the only animals that laugh. Perhaps humor and emotion will end up being the truest test of all.

As for intelligence packed in a robot, it takes one or two forms: rule-based (expert) or neural. It's possible for both forms of intelligence to work in tandem. This synthesis of intelligence will be commonly used in robotics to create a robust intelligence system. Expert (rule-based) intelligence programs are familiar to most people; these are programs written in high-level or low-level languages like C , BASIC, and assembly. Neural systems on the other hand do not have a central processing unit (CPU), rather they function on a neural stimulus-response mechanism. The robotic stimulus-response mechanism goes by a number of names, including neural network, behavioral-based robotics, subsumption architecture, and nervous network. William Grey Walter pioneered behavioral-based robotics in the late 1940s. Independent of Walter's work, neural-based robotic response was academically explored and developed in the 1980s by Valentino Braitenberg in his book *Vehicles: Experiments in Synthetic Psychology*. Rodney Brooks at the Massachusetts Institute of Technology (MIT), inspired by work accomplished by Walter, developed his own derivative of stimulus responses he calls "subsumption architecture." Mark Tilden, inspired by work done by Rodney Brooks, founded BEAM robotics, which uses "nervous nets." Behavioral-based robotics is a hot topic and one that will continue to get hotter in the future. In these architectural schemes the stimulus-response mechanisms can be layered on top of one another. A multilayer stimulus-response mechanism can exhibit what appears as strikingly intelligent behavior. One approach is called "topdown intelligence" and the other is called "bottom-up intelligence. The top-down approach attempts to create an expert system or program to perform a controlled search and discover. The bottom-up approach creates "artificial" behavior in the robot and then causes it to explore and discover. At first glance you may not see much of a difference in either approach, but there is one and it's quite significant. If the expert system approaches a situation (or terrain) it hasn't been programmed

to handle, it will falter. The behavior system on the other hand isn't looking for any template "programmed" situation to calculate procedures and couldn't care less about the situation; it just goes on exploring. Robotists have found over the last 30 years of experimentation that bottom-up programming (behavioral-based) is successful many times where top-down programming fails.

Abridged from "Robots, androids and animatrons" by John Lovine

**III. Match the following phrases from the article.**

neural	system
legitimate	in tandem
self-aware	mechanism
bottom-up	behavioral-based
subsumption	question
to work	a conversation
stimulus-response	network
robotics	approach
robust	architecture
to conduct	machine

**IV. Spell the jumbled words (from the text) correctly.**

Another irenitco (n.)

a vitidifene test (adj.)

perhaps sssccoounnie (n.)... would be ...

fescusclus (adj.) many times

gkitylsrin (adv.) intelligent behaviour

### ***V. Design project.***

Your teacher is a rich investor. He/she has sponsored a robotics design competition. The team who comes up the best idea for a new robot will be awarded 10 million dollars to have their product developed. You and your partner have entered the contest. You have five minutes to think of a new robotics product. When finished, try to sell your idea to your teacher.

### ***VI. Role play***

(note: each student reads his/her role only)

*Student A:* You believe that space exploration is the key to the survival of the human race. Take a minute to think of other reasons why space exploration is important. When ready, ask your partner what she/he thinks of the new mission to Mars.

*Student B:* Governments worldwide spend billions of dollars on space exploration. You believe it's a waste of time and money. The Earth has many problems. We need to fix our own problems instead of flying off into space. Think of other reasons to support your argument. Your partner will start the conversation.

### ***VII. Discuss the questions below in the class.***

1. Do you feel comfortable with the idea of AI (that robots can think)?
2. Do you think we create a new problem with each invention? Think of examples.
3. Is there anything that does not yet exist that you would like to see invented? What is it?
4. Imagine the job you wish to hold when you get older – could a robot be programmed to do that job as well as you?

5. A film like *The Matrix* has explored the idea that we might be living in virtual reality. But what evidence is there for or against this hypothesis? And what are its implications?
6. What name would you give to your robot?
7. Do you agree that robots will always be too expensive for most people?

### ***VIII. Magazine article.***

Write a magazine article about robots. Include an imaginary interview with a robot. Read what you wrote to your classmates in the next lesson. Give each other feedback on your articles.

### ***IX. In pairs / groups, write down questions about robots and their roles in our future.***

- Ask other classmates your questions and note down their answers.
- Go back to your original partner / group and compare your findings.
- Make mini-presentations to other groups on your findings.

### ***X. Translate the text below to English.***

Хорошим примером искусственных агентов служат интеллектуальные роботы. В первую очередь, подобные роботы имеют широкий ассортимент искусственных органов чувств (сенсорные датчики) и искусственных эффекторов (манипуляторы). Их мобильность достигается благодаря колесным, гусеничным, шагающим и прочим системам перемещения. Активность и автономность роботов тесно связаны с наличием средств целеполагания и планирования действий, систем поддержки решения задач, а интеллектуализация, помимо обладания системой обработки знаний, предполагает развитые средства коммуникации различных уровней, вплоть до средств естественно-языкового общения.



Набор сенсорных датчиков внешней и внутренней информации включает: зрительные и звуковые (ультразвуковые), тактильные и кинестетические датчики. Кроме того, часто применяются датчики для измерения температуры, давления, влажности, радиоактивности, магнитного поля и других физических величин.

При зрительном оцувствлении роботов источниками информации служат теле- и видеокамеры, оптические и голографические датчики. К звуковым датчикам относятся микрофоны, эхолокационные датчики и пр. При взаимодействии робота с внешней средой ключевую роль играют тактильные датчики, позволяющие реагировать на прикосновение и измерять давление в местах контакта с объектом среды. Эти датчики служат для обнаружения различных объектов, распознавания внешней обстановки путем ощупывания предметов, а в конечном счете, для получения обратных связей по усилиям.

Неотъемлемым атрибутом интеллектуальных роботов является наличие специальной подсистемы планирования, составляющей программу действий робота в реальных условиях окружающей среды, которые определяются рецепторами робота. Для планирования деятельности робот должен иметь знания о свойствах окружающей среды и путях достижения целей в этой среде.

## FINAL QUIZ

Q1. Which is the first Mechanical calculator?

- (a) Abacus
- (b) Napier's Bones
- (c) Pascaline
- (d) Stepped Reckoner
- (e) None of these

Q2. Which of the following device used 'set of beads' to represent the unit of data?

- (a) ENIAC
- (b) EDVAC
- (c) Abacus
- (d) MARK - I
- (e) None of these

Q3. Rabdologia was the technology used for calculation purpose introduced in \_\_\_\_ .

- (a) 1617
- (b) 1801
- (c) 1824
- (d) 1901
- (e) 1917

Q4. Pascaline is also known as-

- (a) mechanical machine
- (b) adding machine
- (c) division machine
- (d) difference machine
- (e) None of these

Q5. Which was the computer designed by Babbage?

- (a) Analytical engine
- (b) Arithmetic machine
- (c) Donald Knuth
- (d) All of the above
- (e) None of these

Q6. Computer's basic architecture was developed by\_\_\_\_\_

- (a) Charles Babbage
- (b) Blaise Pascal
- (c) Steve Newton
- (d) John Von Neumann
- (e) Henry Johns

Q7. \_\_\_\_\_ is the father of punched card.

- (a) Herman Hollerith
- (b) Joanthan Iva
- (c) Charles Babbage
- (d) Blaise Pascal
- (e) None of these

Q8. The person contributing the idea of stored program was\_\_\_\_\_

- (a) John Neumann
- (b) Howard Aiken
- (c) Dennis Ritchie
- (d) Charles Babbage
- (e) Denial Thomas

Q9. Who has made transistors?

- (a) John William
- (b) Walter Hang
- (c) John Miton
- (d) John Bardeen
- (e) None of these

Q10. Name the first general purpose electronic computer.

- (a) EDVAC
- (b) ADVAC
- (c) Mac
- (d) IBM-PC
- (e) ENIAC

Q11. IBM-PC is an example of -

- (a) First generation computer
- (b) Second generation computer
- (c) Third generation computer
- (d) Fourth generation computer
- (e) None of these

Q12. Pascaline was invented by \_\_\_\_\_.

- (a) Charles Babbage
- (b) Blaise Pascal
- (c) Ada Byron
- (d) Herman Hollerith
- (e) None of these

Q13. The IC chip used in computer, is generally made up of which among the following?

- (a) Silver
- (b) Gold
- (c) Chromite
- (d) Silicon
- (e) Iron

Q14. This type of computer(s) is/are the least powerful, yet the most widely used and fastest-growing computer.

- (a) Mainframe computers
- (b) Super computers
- (c) Micro computers
- (d) All of these
- (e) None of these

Q15. A microcomputer is a small, relatively inexpensive computer with a microprocessor. Which is the first microcomputer?

- (a) Z2
- (b) Tital-1
- (c) MARK-B
- (d) Altair
- (e) None of these

## **INTERESTING FACTS ABOUT COMPUTERS:**

- The first electronic computer ENIAC weighed more than 27 tons and took up 1800 square feet.
- Only about 10% of the world's currency is physical money, the rest only exists on computers.
- TYPEWRITER is the longest word that you can write using the letters only on one row of the keyboard of your computer.
- Doug Engelbart invented the first computer mouse in around 1964 which was made of wood.
- There are more than 5000 new computer viruses are released every month.
- Around 50% of all Wikipedia vandalism is caught by a single computer program with more than 90% accuracy.
- If there was a computer as powerful as the human brain, it would be able to do 38 thousand trillion operations per second and hold more than 3580 terabytes of memory.
- The password for the computer controls of nuclear tipped missiles of the U.S was 00000000 for eight years.
- Approximately 70% of virus writers are said to work under contract for organized crime syndicates.
- HP, Microsoft and Apple have one very interesting thing in common – they were all started in a garage.
- An average person normally blinks 20 times a minute, but when using a computer, he/she blinks only 7 times a minute.
- The house where Bill Gates lives, was designed using a Macintosh computer.
- The first ever hard disk drive was made in 1979, and could hold only 5MB of data.

- The first 1GB hard disk drive was announced in 1980 which weighed about 550 pounds, and had a price tag of \$40,000.
- More than 80% of the emails sent daily are spams.
- A group of 12 engineers designed IBM PC and they were called as “The Dirty Dozen”.
- The original name of windows was Interface Manager.
- The first microprocessor created by Intel was the 4004. It was designed for a calculator, and in that time nobody imagined where it would lead.
- IBM 5120 from 1980 was the heaviest desktop computer ever made. It weighed about 105 pounds, not including the 130 pounds external floppy drive.
- Genesis Device demonstration video in Star Trek II: The Wrath of Khan was the first entirely computer generated movie sequence in the history of cinema. That studio later become Pixar.

## **ANSWER KEY**

### **Answers to Introductory quiz**

1D

2A

3B

4C

5B

6B

7B

8B

9D

10C

### **Answers to ex.4 (Module 4):**

1d, 2f, 3h, 4g, 5a, 6b, 7c, 8e.

### **Answer keys to the crossword (Module 5, ex.5):**

Across: 1. palm, 3. integration, 6.application, 8. manufacure, 9. superhighway, 12. operating, 15. affordable

Down: 2. reliable, 4. mainframe, 5.silicon, 7.spreadsheet, 10.wire, 11.diminish, 13.efficiency, 14.microprocessor, 16.consumer, 17. screen.

### **Answers to Final quiz**

Q1. Ans.(a)

Sol. Abacus is an instrument that was invented some 2500 years ago primarily in China. It was used in the ancient times for calculating numbers through basic arithmetic system.

Q2. Ans.(c)



Sol. Abacus used set of beads to represent the data.

Q3. Ans.(a)

Sol. Napier's bones, also called Napier's rods, are numbered rods which can be used to perform multiplication of any number by a number 2-9. This process was published by Napier in 1617 in a book titled *Rabdologia*, so the process is also called *rabdology*.

Q4. Ans.(b)

Sol. Pascaline, also called Arithmetic Machine, the first calculator or adding machine.

Q5. Ans.(a)

Sol. The Analytical Engine was a proposed mechanical general-purpose computer designed by English mathematician and computer pioneer Charles Babbage

Q6. Ans.(d)

Sol. John Von Neumann wrote an incomplete set of notes, titled the First Draft of a Report on the EDVAC. This widely distributed paper laid foundations of a computer architecture in which the data and the program are both stored in the computer's memory.

Q7. Ans.(a)

Sol. Herman Hollerith was an American inventor who developed an electromechanical punched card

Q8. Ans.(a)

Sol. John Von Neumann wrote an incomplete set of notes, titled the First Draft of a Report on the EDVAC. This widely distributed paper laid foundations of a computer architecture in which the data and the program are both stored in the computer's memory.

Q9. Ans.(d)

Sol. John Bardeen invented the first transistor in 1947.

Q10. Ans.(e)

Sol. ENIAC was the first digital computer and it was invented by J.Presper Eckert and John Mauchly at the university of Pennsylvania and began construction in 1943

Q11. Ans.(d)

Sol. The fourth generation computers emerged with development of the VLSI. The fourth generation computers became more powerful, compact, reliable and affordable. As a result, they give rise to personal computer (PC) revolution. For the first time in 1981 IBM introduced its computer for the home user.

Q12. Ans.(b)

Sol. Pascaline was invented by Blaise Pascal.

Q13. Ans.(d)

Sol. IC chip used in computer are made up of Silicon.

Q14. Ans.(c)

Sol. Micro computer these are small relatively inexpensive computer designed for personal and office use. It has lowest storing and processing speed. These can be laptop or desktop

Q15. Ans.(d)

Sol. Altair 8800 is the first microcomputer.

<http://www.bankersadda.com/p/computer-quiz-on-history-of-computers.html>

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