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УЧЕБНОЕ ПОСОБИЕ ПО АНГЛИЙСКОМУ ЯЗЫКУ ДЛЯ МАГИСТРАНТОВ ТЕХНИЧЕСКИХ ФАКУЛЬТЕТОВ УНИВЕРСИТЕТА

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Включает разделы, в которых представлен учебный материал профессиональной направленности. Содержит оригинальные тексты из иностранных источников, изучение которых – углубленная работа, оформление извлеченной из иностранных источников информации в виде перевода и передача основного содержания на английском языке. Конечная цель – расширение словарного запаса магистрантов и развитие навыков профессионально-ориентированной устной речи, в том числе и неподготовленной. Издание способствует подготовке магистрантов к работе с оригинальной научной литературой по специальности.

Предназначено для магистрантов технических факультетов университета.

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ПРЕДИСЛОВИЕ

Представленное пособие имеет отличительную особенность и формирует навыки самостоятельного чтения с общим пониманием содержания и извлечением основной информации.

Пособие состоит из разделов, которые содержат учебный материал профессиональной направленности, оригинальные тексты из иностранных источников.

Задания после текстов направлены на проверку понимания прочитанного, а также поиск дополнительной информации и оформление усвоенного материала на иностранном языке.

Издание предлагается с целью развития и совершенствования коммуникативной компетенции в процессе чтения и умения вести беседы на профессиональные темы, может быть использовано преподавателями английского языка в учебном процессе в качестве основного и дополнительного практического пособия.

Part I
TEXTS FOR READING AND DISCUSSION
(Tasks to be done in class)

Text 1

Exercise 1. Read and translate the following words and word combinations.

Pure and applied science, totally different activities, interconnection, to establish relationships, phenomena, the working laws of science, to carry out work, practical affairs, to confine attention to explanation, events.

Exercise 2. State the part of speech of the following words and determine their meaning without using a dictionary.

1. Apply, appliance, applicable, applicator, application.
2. Act, action, active, activity, actor, activist.
3. Differ, difference, different.
4. Connect, connector, connection, connective, connectivity.
5. Relate, relation, relationship, relative, relatively, relativity, relativism, relativist.
6. Practical, practically, practice, practitioner.

PURE AND APPLIED SCIENCE

As students of science you are probably sometimes puzzled by the terms "pure" and "applied" science. Are these two totally different activities, having little or no interconnection? Let us begin by examining what is done by each. Pure science is primarily concerned with the development of theories (or, as they are frequently called, models) establishing relationships between the phenomena of the universe. When sufficiently validated these theories (hypotheses, models) become the working laws or principles of science. In carrying out this work, the pure scientist usually disregards its application to practical affairs, confining his attention to explanations of how and why events occur.

Comprehension check-up

Task 1. Answer the following questions.

1. What definition of "pure science" does the author give?
2. When does a hypothesis become a principle of science?
3. What problems does the pure scientist deal with?
4. What is your own explanation of "pure science"?

Task 2. Match the synonyms.

1. total	a) most important
2. different	b) often
3. frequently	c) complete
4. primary	d) possible
5. probable	e) various

Task 3. Choose the correct word to complete the sentences.

1. You are probably sometimes … by the terms "pure" and "applied" science.

a) impressed
b) puzzled
c) inspired

2. Let us begin by … what is done by each.

a) operating
b) confining
c) examining

3. Pure science is primarily … the development of theories establishing relationships.

a) concerned with
b) explained by
c) connected to

4. When sufficiently … these theories become the working laws of science.

a) established
b) validated
c) completed

5. The pure scientist usually … its application to practical affairs.

a) deals with

b) works out

c) disregards

Topics for discussion

1. What can you tell about pure and applied science? Do these two activities really have little or no interconnection?
2. When do different theories become working laws of science?
3. How do you understand the term “pure” scientist?

Text 2

Exercise 1. Read and translate the following words and word combinations.

Exact science, specialized natural science, to provide evidence, pure sense, functional relations, logical systems based on axioms, observations, general laws of matter, subatomic level, structural bonds.

Text 2. MATHEMATIZATION OF NATURAL SCIENCES

Exact science in its generally accepted sense can be referred to as a family of specialized natural sciences, each of them providing evidence and information about different aspects of nature by somewhat different working methods. It follows that mathematics in its pure sense does not enter into this frame, its object of study being not nature itself. Being independent of all observations of the outside world, it attempts to build logical systems based on axioms. In other words, it concentrates on formulating the language of mathematical symbols and equations which may be applied to the functional relations found in nature.

This "mathematization", in the opinion of most specialists, is witnessed first in physics which deals with general laws of matter and energy on subatomic, atomic and molecular levels. Further application of these

mathematical laws and studies is made by chemistry and results in structural bonds between the elements of matter being established.

Comprehension check-up

Task 1. Answer the following questions.

1. What is considered to be “exact science”?
2. How does the author describe “specialized natural sciences”?
3. What is the object of study in mathematics?
4. What laws does physics deal with?
5. What does the application of mathematical laws in chemistry result in?

Task 2. Match the antonyms.

1. general	a) artificial
2. different	b) dirty
3. exact	c) insignificant
4. natural	d) similar
5. pure	e) approximate
6. evident	f) valuable

Task 3. Complete the sentences according to the information given in the text.

1. Exact science can be referred to as a family of … .

a) applied sciences

b) specialized natural sciences

c) pure sciences

2. The object of study in mathematics is … .

a) not nature itself

b) nature itself

c) matter itself

3. Mathematics concentrates on formulating the language of … .

a) functional relations

b) different working methods

c) mathematical symbols and equations

4. Physics deals with general laws of … .
a) matter and energy
b) structural bonds between elements
c) logical systems
5. Further application of these studies results in … .
a) different aspects of nature
b) structural bonds between the elements of matter
c) general laws of matter

Text 3

Exercise 1. Read and translate the following words and word combinations.

In advance, outcome, degree of confidence, degree of doubt, available, confirmability, refutability, reasonable alternative explanation, particular circumstances, to find special explanations, to make a difference.

Exercise 2. Pay special attention to the following prepositions after the given verbs (postpositions) and translate them. Make sentences of your own.

To lead to, to work in, to work on, to work out, to work at, to result in, to result from, to agree with, to agree to, to agree on (upon), to turn to, to turn on, to turn over.

EXPERIMENT AND THEORY

When we carry out an experiment, we do it because we don't know what the result will be. If we knew in advance we wouldn't bother. There must be two, or several, or a large number of possibilities. We may expect one of several outcomes, or we may not know at all what to expect.

For the experiment, whatever its purpose, to be considered a test of some theory, the outcome must make a difference. If the experiment has one result, we must be led to a greater degree of confidence in our theory, if it has another result we must be led to a greater degree of doubt. If the

degree of our belief was unaffected by the result the experiment cannot be said to have been a test, although it may have been valuable or interesting for other reasons.

For a theory to be part of science we must be able to imagine the possibility that some kind of evidence, if it were available, would lead us to make us doubt the theory. It has been said that for a theory to be scientific, it must be refutable.

Nobody needs to be told that theories should be confirmable, in the sense that new experiments must be able to increase our confidence in them - we all take it for granted. We do need to be reminded from time to time that we might be wrong, and should be open to evidence that might show it. Confirmability and refutability are two sides of a single coin. New facts should be able to change our degree of belief one way or another. Only if this is so is our belief scientific.

There are often reasonable alternative explanations why a good theory will fail in some particular circumstances, and even when there aren't, if we think the theory is better than any alternative available we will stick with it and try to find special explanations of why it didn't work in these circumstances.

Comprehension check-up

Task 1. Answer the following questions.

1. What are possible results of an experiment?
2. What is necessary for a theory to be scientific?
3. Give your own explanation to the statement that “theories should be confirmable”.
4. What can change our attitude to scientific theory?
5. Is it possible for a good theory to fail in some particular circumstances?

Task 2. Join the suitable parts.

1. When we carry out the experiment we may expect… a) be confirmable.
2. We carry out the experiment because we don’t know… b) be refutable.
3. If the experiment has one result, we must be led to… c) be refutable.
4. Nobody needs to be told that theories should… d) one of several outcomes.

5. For a theory to be scientific, it must … e) what the result will be.

Task 3. Arrange the sentences in their logical order.

1. New experiments must be able to increase our confidence in them.
2. For a theory to be scientific, it must be refutable.
3. When we carry out an experiment, we may expect one of several outcomes.
4. There are often reasonable alternative explanations why a good theory will fail in some particular circumstances.
5. Confirmability and refutability are two sides of a single coin.

Task 4. Before reading the text discuss the following questions.

1. Do you have a mobile phone? How long have you had it?
2. What do you use it for? How often do you use it?
3. Is it an important part of everyday life in your country?

Task 5. Match the words and phrases with their definitions.

1. stagnate v(stagnated)
2. ubiquitous
adj.(ubiquity)
3. taciturn adj.
4. dexterity n
5. blur v(blurring)

a) to become or make smth become difficult to distinguish clearly
b) skill in using your hands or your mind
c) seeming to be everywhere or in several places at the same time
d) tending not to say very much, in a way that seems unfriendly
e) to stop developing or making process

Text 4. MUCH MORE THAN A CONTACT LENS

Part 1

Super contact lenses which display background information onto your real world view seem like a gadget taken from the latest Spielberg

movie. Thanks to a recently developed technique, this scenario may soon be real.

A contact lens with integrated circuitry. A researcher of the University of Washington holds a contact lens which embeds LEDs and other electrical components and which is manufactured using their newly developed self-assembly technique.

Imagine you are visiting a small town for the first time. Suddenly, you bump into a monument and wonder what it is. Faster than the blink of an eye, the special contact lenses that you are wearing display the name of the monument with a short description directly retrieved from the web.

Contact lenses which look exactly like ordinary contact lenses, but with a LED display embedded, have been developed by researchers at the University of Washington (Seattle, USA) led by Babak Parviz. These super contact lenses could offer the perfect platform for Augmented Reality: an important branch of computer science where computer generated images are super-imposed onto the real world; a technique which improves our perception of reality by allowing us to see interesting information that pops up as we look around. The effect is almost like having a sixth sense! Augmented Reality has recently started to become widely available thanks to new generation of mobile devices. Smart phones, which embed digital compasses and video cameras, are able to calculate where the user is pointing the device and overlay data onto a scene accordingly. This hardware was the missing link to finally offer Augmented Reality applications to a wide audience.

There is still a drawback though. Imagine if you walked around constantly looking at the real world through the screen of your mobile phone, your hands would always be busy holding the phone out in front of you and, in all truthfulness, you would look most peculiar. This is when the new contact lens, developed in Washington, comes into play. "An image projection system based on contact lenses offers an interesting platform for augmented reality," confirms J. Webster Stayman at Michigan Tech Research Institute (Michigan, USA), who has years of experience in the design of imaging systems. We could think about overlaying all kinds of im-

ages onto a scene: annotations, metrics, and virtual objects. Moreover, since different images can be placed in either eye, it is also possible to do depth encoding for 3D objects, making the displayed virtual objects appear even more real. "All of this," adds Stayman, "can potentially be accomplished in a relatively small unobtrusive package that is already familiar to millions of people, such as a contact lens."

The new technique developed by the researchers at the University of Washington allows to place circuitry, including light emitting diodes (LEDs), onto contact lenses. "We are working on converting conventional contact lenses into functional displays," Parviz explains. "On this behalf, we have just demonstrated powering and controlling light sources on the contact lens through a wireless link."

Notes:

• self-assembly – самосборка
• embed – вставлять, врезать, вделывать
• super-impose (on) – накладывать (одно на другое)
• perception – восприятие, ощущение
• drawback – препятствие; помеха, преграда, препона

Task 1. Finish the sentences according to the text:

1. Super contact lenses look like ordinary contact lenses, but …
2. These contact lenses can offer…
3. Now researchers are working on …

Task 2. Find synonyms for the following verbs:

Accomplish, wonder, retrieve, offer, generate, impose, allow, explain.

Task 3. Find in the text the expressions that mean:

• meet somebody/something unexpectedly
• fix (an object) firmly and deeply in a surrounding mass
• a feature that renders something less acceptable; a disadvantage or problem
• having been made greater in size or value
• to start functioning
• appear in a place or situation unexpectedly

Task 4. Explain the following in your own words.

Gadget, science fiction, LED display, 3D object.

Task 5. Fill in the blanks with suitable preposition (in front of, by, at, on, of, in, with, for, through).

1. Imagine if you walked around constantly looking …the real world …the screen… your mobile phone, your hands would always be busy holding the phone out… you and, in all truthfulness, you would look most peculiar.
2. Contact lenses which look exactly like ordinary contact lenses, but … a LED display embedded, have been developed … researchers … the University … Washington led … Babak Parviz.
3. "An image projection system based … contact lenses offers an interesting platform … augmented reality," confirms J. Webster Stayman … Michigan Tech Research Institute, who has years … experience … the design … imaging systems.

Text 5. MUCH MORE THAN A CONTACT LENS

Part 2

Biocompatibility tests. Contact lenses with electronic components were safely worn by rabbits for up to 20 minutes in laboratory tests.

The new manufacturing process is based on a self-assembly technology, which allows electrical micron-scale components to lock onto their predestined locations on the contact lens without explicit human intervention. "This process does not require individual mechanical placement of the elements on a substrate. A process that, otherwise, would be extremely difficult and time consuming given the very small size of the electronic components," comments Stayman. The microelectronics industry is already capable of producing all kinds of micron-scale electronic subsystems, such as antennas, wireless data transmitters/receivers, display control circuits, optoelectronic display pixels, biosensors, etc. But the real challenge in this case was to integrate all of these into a functional system on the top of an unconventional substrate, such as the polymer that a contact lens is made from.

The production of such contact lenses involves three main steps. First, a plastic template is created as a mould for micron sized metal contacts: this mould, on which the metal contacts are then coated, is created by digging guidelines into a plastic (PET) sheet using a photolithography process. Then the self-assembly step is quite simple: the plastic template is dipped into a special solution with some microelectronics components; thanks to capillary forces, the components then bind with the plastic templates in the desired location. Finally, the surface is encapsulated with a biocompatible material and pressed using a heated aluminum mould which imparts a permanent curvature on it, creating the contact lens. In the near future, then, should we expect to be able to wear a super contact lens wirelessly coupled with our mobile phone, similarly to a Bluetooth headset? Well, there are still a number of challenges to overcome before this scenario becomes reality.

First of all, a high resolution display still needs to be embedded in the contact lens. This new technique is suitable for this purpose but "we are still at the beginning of this path," admits Parviz, "even if our manufacturing technique in principle allows for integration of a large number of pixels." There are also other technical issues to solve; most importantly, such contact lenses are likely to be restricted to display just transparent overlaying images. The reason is that we still cannot selectively block light from the scene to create an opaque overlay. As Stayman explains, "the lens is located, quite literally, at the pupil plane of the imaging system and overlaying images so close to the center of the eye would only change the optical response – i.e. blurring of the scene," like having a micro-spotlight just in front of your eye! So will it ever be possible to show opaque images on the contact lens? Stayman believes that "we could control the transparency of the entire contact lens," modifying the contrast between the overlaying image and the real world. Almost like turning down the lights a little bit. This would allow our eye to better distinguish the virtual objects displayed on the lens, switching the focus from the real scene on the background to the virtual annotation on the foreground.

Finally, the most intriguing challenge is to understand how to deal with the constant movements of our eyes. "When we look at something we are constantly scanning the scene for content, with our eyes darting from

area to area; this is because we use the fovea – the high resolution portion of our retina – for close inspection of scene content," says Stayman. "The contact lens will move with the eye.

Thus to keep a virtual object or annotation fixed within a scene, the image displayed on the contact lens must be moved in a direction to compensate for the eyes motions.

This would require some form of eye tracking device – potentially also in the contact lens itself. Such a tracking system would need to be quite fast and accurate for virtual objects to appear stationary." Considering these and other issues, it is still not completely clear how these contact lenses will be converted into fully working devices able to provide a good platform for Augmented Reality. Thanks to Parviz and his collaborators' work, nonetheless, the day when we can simply blink and see all kinds of useful information popping up in front of our eyes might not be so far away.

Notes:

• biocompatibility – биосовместимость
• predestine – предназначать, предопределять
• explicit – ясный, подробный; подробно разработанный, высказанный до конца; явный; определённый, точный
• distinguish – 1) различить, разглядеть, рассмотреть;
2) проводить различие, находить отличия; различать, распознавать
• mould – лекало, образец, трафарет, (литейная) форма
• template – лекало, образец, трафарет, шаблон
• curvature – выгиб, изгиб, искривление, кривизна
• transparent – прозрачный, просвечивающий
• opaque – непрозрачный; непроницаемый, тёмный
• pupil – зрачок
• fovea – углубление, впадина

Task 1. Check up for comprehension.

1. What is "self-assembly technology"?
2. What main steps does the production of the lens involve?
3. How can the problem of the constant movement of our eyes be solved?

4. What problem is described in the paragraph started with “First of all…”? What solution is offered?

Task 2. Find synonyms for the following adjectives.

Intriguing, simple, explicit, difficult, main, constant, permanent.

Task 3. Match two halves of the expressions bellow and give a Russian equivalent.

1. Predestined	a. system
2. Unconventional	b. technique
3. time	c. coupled
4. laboratory	d. substrate
5. digging	e. consuming
6. wirelessly	f. guideline
7. manufacturing	g. response
8. optical	h. test
9. tracking	i. location

Task 4. Choose the right continuation for each sentence.

1. Such contact lenses are likely ...

a) restrict to display just transparent overlaying images.

b) to be restricted to display just transparent overlaying images.

c) to restrict to display just transparent overlaying images.

2. Should we expect to be able …

a) wear a super contact lens wirelessly coupled with our mobile phone, similarly to a Bluetooth headset?

b) to be worn a super contact lens wirelessly coupled with our mobile phone, similarly to a Bluetooth headset?

c) to wear a super contact lens wirelessly coupled with our mobile phone, similarly to a Bluetooth headset?

3. The image displayed on the contact lens must...

a) be moved in a direction to compensate for the eyes motions.

b) to be moved in a direction to compensate for the eyes motions.

c) moved in a direction to compensate for the eyes motions.

4. The day when we can simply blink and see all kinds of useful information

popping up in front of our eyes might …

a) be not so far away.
b) not to be so far away.
c) not be so far away.

Text 6. INFORMATION TECHNOLOGY

Information technology (IT), as defined by the Information Technology Association of America (ITAA), is "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit, and securely retrieve information.

Today, the term information technology has ballooned to encompass many aspects of computing and technology, and the term has become very recognizable.

IT professionals perform a variety of duties that range from installing applications to designing complex computer networks and information databases.

A few of the duties that IT professionals perform may include data management, networking, engineering computer hardware, database and software design, as well as the management and administration of entire systems.

When computer and communications technologies are combined, the result is information technology, or "infotech". Information technology is a general term that describes any technology that helps to produce, manipulate, store, communicate, and/or disseminate information. Presumably, when speaking of Information Technology (IT) as a whole, it is noted that the use of computers and information are associated.

In recent years ABET and the ACM have collaborated to form accreditation and curriculum standards for degrees in Information Technology as a distinct field of study separate from both Computer Science and Information Systems.

SIGITE is the ACM working group for defining these standards. Information and communication technologies (ICT) is an umbrella term that covers all technical means for processing and communicating information.

The term has gained popularity partially due to the convergence of information technology (IT) and telecom technology. ICT defines a broad range of technologies, including methods for communication (communication protocols, transmission techniques, communications equipment, media (communication)), as well as techniques for storing and processing information (computing, data storage, etc.)

There are claims that the expression "information and communication technology" should not refer only to contemporary or automated technological artifacts; paper-based writing, being itself a technology ontologically, can be included as pre-digital means of generating information (or communication).

So, the term ICT has been incorrectly associated only with digital technologies – analogue and even mechanical systems can be considered as ICT, although the use of the expression in that context is rare and limited.

Another shortcoming, particularly in education, is that the term 'ICT' is used synonymously with the term computer technology, and is not usually applied with the rest of the technologies that are used in our daily lives – cell phones, cameras, satellite receivers, media players, game consoles, etc.

ICT may not survive in its present form for long. Sooner than later, developing countries would get over the PC mania prevalent now, unless there is a remarkable change in the economy of having a desktop PC. Any technology that requires the masses to own a PC, in its present form, to access information is unlikely to be successful in the foreseeable future. Possibilities appear to exist, however, in the mobile phone technology, which is fast becoming very affordable by the masses, is voice based and can be integrated with the Information Technology at the server end of a computer network. For example, in the field of education people can ask questions through a mobile phone, a database of answers to such questions can be generated using these technologies.

Currently what is in Wikipedia and call centers and the text in these databases could be converted into voice, by developing text to voice technologies in the various languages. The person seeking information can be informed when answers are available and better answers can be sought

based on his/her feedback. The emerging 3G and 4G mobile phone technologies can indeed facilitate such developments. An alternative technology could be to integrate the mobile phone with the television screen, so that visual information can be viewed easily. Similarly, there is the possibility for developing interactive radio, on the lines of interactive TV.ICT allows users to participate in a rapidly changing world in which work and other activities are increasingly transformed by access to varied and developing technologies.

ICT tools can be used to find, explore, analyze, exchange and present information responsibly and without discrimination. ICT can be employed to give users quick access to ideas and experiences from a wide range of people, communities and cultures.

Task 1. Match the parts of the sentences

Information technologies	to find, explore, analyze, exchange and present information responsibly and without discrimination
Information communication technologies	as any technology that requires the masses to own a PC to access information is unlikely to be successful in the foreseeable future
Among the duties of IT professionals	the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware
ICT may not survive in its present form for long	a general term that describes any technology that helps to produce, manipulate, store, communicate, and/or disseminate information
ICT tolls can be used	include data management, networking, engineering computer hardware, database

	and software design, as well as the management and administration of entire systems

Task 2. Comprehension check-up:

1) Which term has a broader meaning: IT or ICT?

2) Is a person who has graduated with a degree in Computer Science the same specialist as one holding a degree in Information Technology?

3) What duties do IT professionals perform?

4) The text contains two definitions of IT. Compare the both and decide whether there are any differences between them.

5) What form are Information and Communication Technologies likely to take in the future?

6) How can a person benefit from using ICT tools?

Task 3. Agree or disagree:

1) Paper-based writing, being itself a technology ontologically, can be called an example of ICT.

2) Any technology that requires the masses to own a PC to access information is unlikely to be successful in the foreseeable future.

Text 7. DATA SECURITY TECHNOLOGIES

Part I

Data security is the means of ensuring that data is kept safe from corruption and that access to it is suitably controlled. Thus data security helps to ensure privacy. It also helps in protecting personal data. There are different data security technologies such as: Disk encryption Disk encryption refers to encryption technology that encrypts data on a hard disk drive. Disk encryption typically takes form in either software (see disk encryption software) or hardware (see disk encryption hardware). Disk encryption is often referred to as on-the-fly encryption or transparent encryption.

On-the-fly encryption (OTFE), also known as Real-time Encryption, is a method used by some encryption programs, for example, disk encryption software. "On-the-fly" refers to the fact that the files are accessible

immediately after the key is provided, and the entire volume is typically mounted as if it were a physical drive, making the files just as accessible as any unencrypted ones.

Hardware based Mechanisms for Protecting Data

Software based security solutions encrypt the data to prevent data from being stolen. However, a malicious program or a hacker may corrupt the data in order to make it unrecoverable or unusable. Similarly, encrypted operating systems can be corrupted by a malicious program or a hacker, making the system unusable. Hardware-based security solutions can prevent read and write access to data and hence offers very strong protection against tampering and unauthorized access.

Hardware based or assisted computer security offers an alternative to software-only computer security. Security tokens such as those using PKCS may be more secure due to the physical access required in order to be compromised.

`Access is enabled only when the token is connected and correct PIN is entered (see two factor authentication). However, dongles can be used by anyone who can gain physical access to it. Newer technologies in hardware based security solves this problem offering fool proof security for data.

Working of Hardware based security: A hardware device allows a user to login, logout and to set different privilege levels by doing manual actions. The device uses biometric technology to prevent malicious users from logging in, logging out, and changing privilege levels. The current state of a user of the device is read by controllers in peripheral devices such as hard disks. Illegal access by a malicious user or a malicious program is interrupted based on the current state of a user by hard disk and DVD controllers making illegal access to data impossible. Hardware based access control is more secure than protection provided by the operating systems as operating systems are vulnerable to malicious attacks by viruses and hackers. The data on hard disks can be corrupted after a malicious access is obtained. With hardware based protection, software cannot manipulate the user privilege levels, it is impossible for a hacker or a malicious program to gain access to secure data protected by hardware or perform

unauthorized privileged operations. The hardware protects the operating system image and file system privileges from being tampered.

Therefore, a completely secure system can be created using a combination of hardware based security and secure system administration policies.

Newer technologies in hardware based security solves this problem offering fool proof security for data. A security token (or sometimes a hardware token, hard token, authentication token, USB token, cryptographic token, or key fob) may be a physical device that an authorized user of computer services is given to ease authentication. The term may also refer to software tokens.

Security tokens are used to prove one's identity electronically (as in the case of a customer trying to access their bank account). The token is used in addition to or in place of a password to prove that the customer is who they claim to be. The token acts like an electronic key to access something.

Hardware tokens are typically small enough to be carried in a pocket or purse and often are designed to attach to the user's keychain. Some may store cryptographic keys, such as a digital signature, or biometric data, such as a fingerprint minutiae. Some designs feature tamper resistant packaging, while others may include small keypads to allow entry of a PIN or a simple button o start a generating routine with some display capability to show a generated key number. Special designs include a USB connector, RFID functions or Bluetooth wireless interface to enable transfer of a generated key number sequence to a client system.

Text 8. DATA SECURITY TECHNOLOGIES

Part II

Backups

In information technology, a backup or the process of backing up refers to making copies of data so that these additional copies may be used to restore the original after a data loss event. These additional copies are typically called "backups." The verb is *back up* in two words, whereas the

noun *is backup* (often used like an adjective in compound nouns). Backups are useful primarily for two purposes. The first is to restore a state following a disaster. The second is to restore small numbers of files after they have been accidentally deleted or corrupted. Data loss is also very common. 66% of internet users have suffered from serious data loss. Since a backup system contains at least one copy of all data worth saving, the data storage requirements are considerable.

Organizing this storage space and managing the backup process is a complicated undertaking. A data repository model can be used to provide structure to the storage. In the modern era of computing there are many different types of data storage devices that are useful for making backups. There are also many different ways in which these devices can be arranged to provide geographic redundancy, data security, and portability. Before data is sent to its storage location, it is selected, extracted, and manipulated. Many different techniques have been developed to optimize the backup procedure. These include optimizations for dealing with open files and live data sources as well as compression, encryption, and de-duplication, among others. Many organizations and individuals try to have confidence that the process is working as expected and work to define measurements and validation techniques. It is also important to recognize the limitations and human factors involved in any backup scheme.

Data masking

Data masking is the process of obscuring (masking) specific data elements within data stores. It ensures that sensitive data are replaced with realistic but not real data. The goal is that sensitive customer information is not available outside of the authorized environment. Data masking is typically done while provisioning non-production environments so that copies created to support test and development processes are not exposing sensitive information and thus avoiding risks of leaking. Masking algorithms are designed to be repeatable so referential integrity is maintained. Common business applications require constant patch and upgrade cycles and require that 6-8 copies of the application and data be made for testing.

While organizations typically have strict controls on production systems, data security in non-production instances is often left up to trusting the employee, with potentially disastrous results. Creating test and development copies in an automated process reduces the exposure of sensitive data. Database layout often changes, it is useful to maintain a list of sensitive columns in a without rewriting application code. Data masking is an effective strategy in reducing the risk of data exposure from inside and outside of an organization and should be considered a best practice for curing non-production databases.

Data erasure

Data erasure is a method of software-based overwriting that completely destroys all electronic data residing on a hard disk drive or other digital media.

Permanent data erasure goes beyond basic file deletion commands, which only remove direct pointers to data disk sectors and make data recovery possible with common software tools. Unlike degaussing and physical destruction, which render the disk unusable, data erasure removes all information while leaving the disk operable, preserving assets and the environment. Software based overwriting uses a software application to write patterns of meaningless data onto each of a hard drive's sectors. There are key differentiators between data erasure and other overwriting methods, which can leave data intact and raise the risk of data breach or spill, identity theft and failure to achieve regulatory compliance. Data erasure also provides multiple overwrites so that it supports recognized government and industry standards. It provides verification of data removal, which is necessary for meeting certain standards.

To protect data on lost or stolen media, some data erasure applications some data erasure applications remotely destroy data if the password is incorrectly entered. Data erasure tools can also target specific data on a disk for routine erasure, providing a hacking protection method that is less time-consuming than encryption.

Task 1. Match each of the words from the first column with a word from the second column to make six word partnerships from the text:

1) data	method
2) backup	code
3) application	media
4) digital	deletion
5) file	loss
6) overwriting	procedure

Task 2. Comprehension check-up:

1) What does the process of backing up refer to?
2) What purposes are backups useful to?
3) What techniques have been developed to optimize the back up procedure?
4) What is data masking?
5) What data security technology should be considered a best practice for curing non-production databases?
6) What method of software-based overwriting completely destroys all electronic data residing on a hard disk drive or other digital media?
7) What method of protecting data is less time-consuming?
8) Are there key differentiators between data erasure and other overwriting methods?

Task 3. Which statements are true? Correct the false ones:

1) The process of backing up refers to encrypting data on a hard disk drive.
2) Data masking is an effective strategy in reducing the risk of data exposure from inside and outside the organization.
3) Data erasure can not provide multiple overwrites.
4) Data masking ensures that sensitive data is replaced with real data.
5) The goal of data erasure is that sensitive customer information is not available outside of the authorized environment.

Text 9. MALWARE

Malware, short for malicious software, is software designed to infiltrate or damage a computer system without the owner's informed consent. The expression is a general term used by computer professionals to mean a variety of forms of hostile, intrusive, or annoying software or program code. The term "computer virus" is sometimes used as a catch-all phrase to include all types of malware, including true viruses.

Software is considered malware based on the perceived intent of the creator rather than any particular features. Malware includes computer viruses, worms, trojan horses, most rootkits, spyware, dishonest adware, crimeware and other malicious and unwanted software.

The best-known types of malware, viruses and worms, are known for the manner in which they spread, rather than any other particular behavior. The term computer virus is used for a program that has infected some executable software and that causes that software, when run, to spread the virus to other executable software. Viruses may also contain a payload that performs other actions, often malicious. A worm, on the other hand, is a program that actively transmits itself over a network to infect other computers. It too may carry a payload.

These definitions lead to the observation that a virus requires user intervention to spread, whereas a worm spreads automatically. Using this distinction, infections transmitted by email or Microsoft Word documents, which rely on the recipient opening a file or email to infect the system, would be classified as viruses rather than worms. Some writers in the trade and popular press appear to misunderstand this distinction, and use the terms interchangeably.

Task 1. Match the word with its definition:

1) malware	**a**. a self-replicating computer program
2) virus b.	**b**. a software system that consists of one or more programs designed to obscure the fact that a system has been compromised

3) worm c.	**c**. a computer program that watches what people do with their computers, and then sends that information over the Internet
4) trojan horse	**d.** any software package which automatically plays, displays, or downloads advertisements to a computer after the software is installed on it or while the application is being used
5) rootkit	**e.** computer software that is designed to damage the way a computer works
6) spyware	**f.** non-self-replicating malware that appears to perform a desirable function for the user but instead facilitates unauthorized access to the user's computer system
7) adware	**g**. a class of malware designed specifically to automate cybercrime
8) crimeware	h) a computer program or art of a computer program which can make copies of itself and is intended to prevent the computer from working normally

Task 2. Comprehension check-up:

1) What is malware designed for?
2) What does the term “computer virus” mean?
3) What does malware include?
4) What are the best-known types of malware?
5) How can viruses and worms be differentiated?

Task 3. Fill in the gaps with the missing words from the table to learn more about rootkits:

A rootkit is a software _____(1) that consists of one or more programs designed to obscure the fact that a system has been compromised. Contrary _____(2) what its name may imply, a rootkit does

not grant a user administrator privileges, as it requires prior access to execute and tamper with system files and processes. An attacker _____(3) _____(4) a rootkit to replace _____(5) system executables, _____(6) may then be used to hide processes and files the attacker has installed, along with the presence of the rootkit. Access to the hardware, _____(7), the reset switch, is rarely required, as a rootkit is intended to seize control of the operating _____(8). Typically, rootkits act to obscure their presence on the system through subversion or evasion of standard operating system security scan and surveillance mechanisms such as anti-virus or antispyware scan. Often, they are Trojans as well, thus fooling users into believing they are safe to run _____(9) their systems. Techniques used to accomplish this can include concealing running processes from monitoring programs, or hiding files or system _____(10) from the operating system. Rootkits may _____(11) install a "back door" in a system by replacing the login mechanism (such as /bin/login) with an executable that accepts a secret login combination, which, in turn, allows an attacker to access the system, regardless of the changes to the actual accounts on the system.

Rootkits may have originated as regular applications, intended to take control of a failing or unresponsive system, but in recent years have been largely malware _____(12) help intruders gain access to systems while avoiding detection. Rootkits exist for a variety of operating _____(13), such as Microsoft Windows, Linux, Mac OS, and Solaris.

Rootkits often modify parts of the operating system or install themselves as drivers or kernel modules, depending on the _____(14) details of _____(15) operating system's mechanisms.

which	data	also	system	system	use	to	systems	
vital	internal	an	to	on	may	e.g.		

Text 10. WIRELESS CONNECTION

Part I

Wireless communications are various telecommunications systems that use radio waves to carry signals and messages across distances. Wireless communications systems use devices called transmitters to generate radio waves. A microphone or other mechanism converts messages, like sounds or other data, into electronic impulses. The transmitters change, or modulate, the radio waves so they can carry the impulses, and then transmit the modulated radio signals across distances. Radio receivers pick up these signals and decode them back into original messages. Commercial radio and television are also wireless telecommunications system, but radio and television are mainly public broadcast services rather than personal communications systems.

Wireless communications allow people greater flexibility while communicating, because they do not need to remain at a fixed location, such as a home or office. Wireless technologies make communications services more readily available than traditional wire-based services (such as ordinary telephones), which require the installation of wires. This is useful in places where only temporary communications services are needed, such as at outdoor festivals or large sporting events. These technologies are also useful for communicating in remote locations, such as mountains, jungles, or deserts, where telephone service might not exist. Wireless services allow people to communicate while in a car, airplane, or other moving vehicle. Police, fire, and other emergency departments use two-way radio to communicate information between vehicles that are already responding to emergency calls, which saves valuable time. Construction and utility workers frequently use hand-held radios for short-range communication and coordination. Many businesspeople use wireless communications, particularly cellular radio telephones, to stay in contact with colleagues and clients while traveling.

All wireless communications devices use radio waves to transmit and receive signals. These devices operate on different radio frequencies so that signals from one device will not overlap and interfere with nearby transmissions from other devices.

Principles of Wireless Communications

Wireless communications begin with a message that is converted into an electronic signal by a device called a transmitter. The transmitter uses an oscillator to generate radio waves. The transmitter modulates the radio wave to carry the electronic signal and then sends the modified radio signal out through space, where it is picked up by a receiver. The receiver decodes, or demodulates, the radio wave and plays the decoded message over a speaker. Wireless communications provide more flexibility than wire-based means of communication. However, there are some drawbacks. Wireless communications are limited by the range of the transmitter (how far a signal can be sent), and since radio waves travel through the atmosphere, they can be disturbed by electrical interferences (such as lightning) that cause static.

Wireless communications systems involve either one-way transmissions, in which a person merely receives notice of a message, or two-way transmissions, such as a telephone conversation between two people. An example of a device that sends one-way transmission is a pager, which is a radio receiver. When a person dials a pager number, the pager company sends a radio signal to the desired pager. The encoded signal triggers the pager circuitry and notifies the customer carrying the pager of the incoming call with a tone or a vibration, and often the telephone number of the caller. Advanced pagers can display short messages from the caller, or provide news updates or sports scores.

Two-way transmissions require both a transmitter and a receiver for sending and receiving signals. A device that functions as both a transmitter and a receiver is called a transceiver. Cellular radio telephones and two-way radios use transceivers, so that back-and-forth communication between two people can be maintained. Early transceivers were very large, but they have decreased in size due to advances in technology. Fixed-base transceivers, such as those used at police stations, can fit on a desktop, and hand-held transceivers have shrunk in size as well. Several current models of hand-held transceivers weigh less than 0.2 kg (0.5 lb).

Text 11. WIRELESS COMMUNICATIONS

Part II

Modes of Wireless Communications

Wireless communications systems have grown and changed as technology has improved. Several different systems are used today, all of which operate on different radio frequencies. New technologies are being developed to provide greater service and reliability.

A Air Transceivers

Radio operators still monitor distress channels, but maritime and aviation telecommunications systems now use high-frequency radios and satellites capable of transmitting speech, rather than wireless telegraphy, to send messages. Aircraft pilots use radios to communicate with air traffic controllers at airports and also to communicate with other pilots. Navigation beacons are equipped with transmitters that send automated signals to help ships and aircraft in distress determine their positions. While high-frequency radio can transmit signals over long distances, the quality of these signals can be diminished by bad weather or by electrical interference in the atmosphere, which is often caused by radiation from the sun.

B Hand-Held Radio Transceivers

Police, fire, and other emergency organizations, as well as the military, have used two-way wireless radio communication since the 1930s. Early vehicle-based radios were large, heavy units. After the invention of the transistor in 1948, radios shrank in size to small hand-held radio transceivers, which civil authorities now use to communicate with each other directly. Public two-way radios with several frequency options are widely available as well. Usually limited in range to a few miles, these units are great aids for such mobile professionals as construction workers, film crews, event planners, and security personnel. Simpler two-way radios, called walkie-talkies, have been popular children's toys for years.

C Shortwave

Long-range broadcast services and frequencies, in what is known as the shortwave radio band (with frequencies of 3 to 30 megahertz), are available for amateur or ham radio operators. Shortwave radio broadcasts can

travel long distances because of the concentration of ionized, or electrically charged, particles in the layer of the atmosphere known as the ionosphere. This layer reflects radio signals, sending signals that are transmitted upward back to earth. This skipping of waves against the ionosphere can greatly increase the range of the transmitter. The degree of reflectivity of the ionosphere depends on the time of day.

D Cellular Radio Telephones

Cellular radio telephones, or cell phones, combine their portable radio capability with the wired, or wireline, telephone network to provide mobile users with access to the rest of the public telephone system used by non-mobile callers. Modern cellular telephones use a network of several short-range antennas that connect to the telephone system. Because the antennas have a shorter range, frequencies can be reused a short distance away without interference.

E Satellite Communications

Satellite communications services connect users directly to the telephone network from almost anywhere in the world. Special telephones are available to consumers that communicate directly with communications satellites orbiting the earth. The satellites transmit these signals to ground stations that are connected to the telephone system. These satellite services, while more expensive than cellular or other wireless services, give users access to the telephone network in areas of the world where no telephone service exists.

The number of companies offering wireless communications services has grown steadily in recent years. In 1988 about 500 companies offered cellular radio telephone (cell phone) services. By 1995 that number had grown to over 1500 companies serving millions of subscribers. Wireless communication is becoming increasingly popular because of the convenience and mobility it affords, the expanded availability of radio frequencies for transmitting, and improvements in technology.

Comprehension check-up

1. What functions do transmitters perform? 2. What functions do receivers perform? 3. What are the advantages of wireless communications? 4. Has the number of companies offering wireless communications services grown steadily in recent years? 5. What are the main principles of wireless communications? 6. How does a pager work? 7. What devices use transceivers? 8. What can diminish the quality of high-frequency radio signals? 9. What devices are great aids for mobile professionals? 10. Why can shortwave radio broadcasts travel long distances? 11. What are cellular radio telephones used for? 12. What are the merits of satellite communications services.

Text 12. FIBER OPTICS

Fiber optics is a branch of optics dealing with the transmission of light through fibers or thin rods of glass or some other transparent material of high refractive index. If light is admitted at one end of a fiber, it can travel through the fiber with a very low loss, even if the fiber is curved.

The principle on which this transmission of light depends is that of total internal reflection: Light traveling inside the fiber center, or core, strikes the outside surface at an angle of incidence greater than the critical angle, so that all the light is reflected toward the inside of the fiber without loss. Thus light can be transmitted over long distances by being reflected inward thousands of times. In order to avoid losses through the scattering of light by impurities on the surface of the fiber, the optical fiber core is clad with a glass layer of much lower refractive index; the reflections occur at the interface of the glass fiber and the cladding.

The simplest application of optical fibers is the transmission of light to locations otherwise hard to reach, for example, the bore of a dentist's drill. Also, bundles of several thousand very thin fibers assembled precisely side by side and optically polished at their ends, can be used to transmit images. Each point of the image projected on one face of the bundle is re-

produced at the other end of the bundle, reconstituting the image, which can be observed through a magnifier. Image transmission by optical fibers is widely used in medical instruments for viewing inside the human body and for laser surgery, in facsimile systems, in phototypesetting, in computer graphics, and in many other applications.

Optical fibers are also being used in a wide variety of sensing devices, ranging from thermometers to gyroscopes. The potential of their applications in this field is nearly unlimited, because the light sent through them is sensitive to many environmental changes, including pressure, sound waves, and strain, as well as heat and motion. The fibers can be especially useful where electrical effects could make ordinary wiring useless, less accurate, or even hazardous. Fibers have also been developed to carry high-power laser beams for cutting and drilling.

One growing application of optical fibers is in communication. Because the information-carrying capacity of a signal increases with frequency, the use of laser light offers many advantages. Fiber-optic laser systems are being used in communications networks. Many long-haul fiber communications networks for both transcontinental connections and, through undersea cables, international connections are in operation. One advantage of optical fiber systems is the long distances that can be maintained before signal repeaters are needed to regenerate signals. These are currently separated by about 100 km (about 62 mi), compared to about 1.5 km (about 1 mi) for electrical systems. Newly developed optical fiber amplifiers can extend this distance even farther.

Local area networks are another growing application for fiber optics. Unlike long-haul communications, these systems connect many local subscribers to expensive centralized equipment such as computers and printers. This system expands the utilization of equipment and can easily accommodate new users on a network. Development of new electro-optic and integrated-optic components will further expand the capability of fiber systems.

Comprehension check-up

Task 1. Answer the following questions

1. What is fiber optics? 2. What is the principle of light transmission? 3. How can we avoid losses during transmission? 4. Where do the reflections occur? 5. How can one transmit images using optical fibers? 6. Where is image transmission used? 7. Why do applications of sensing devices are almost unlimited? 8. Why are optical fibers widely used in communication? 9. How can subscribers get the benefit from systems with optical fibers? 10. What will further expand the capability of fiber systems?

Task 2. Are the following statements True or False?

1. Fiber optics deals with the transmission of light through opaque materials. 2. The fibers are used where electrical effects could make ordinary wiring useless and less accurate. 3. In order to avoid losses the optical fiber core is cleaned from a glass layer. 4. The fibers are absolutely useless where electrical effects could make ordinary wiring useful and more accurate. 5. Long-haul fiber communication networks are used for international and transcontinental connections.

Task 3. Divide the text into paragraphs.

Task 4. Express the main idea of each paragraph in one sentence.

Task 5. Summarize the text and be ready to retell it

Task 6. Speak on pros and cons of fiber optics if any.

Text 13. GLOBAL POSITIONING SYSTEM (GPS)

1. Introduction

Global Positioning System (GPS) is a space-based radio-navigation system, consisting of 24 satellites and ground support. GPS provides users with accurate information about their position and velocity, as well as the time, anywhere in the world and in all weather conditions.

2. History and Development

GPS, formally known as the Navstar Global Positioning System, was initiated in 1973 to reduce the proliferation of navigation aids. GPS is op-

erated and maintained by the United States Department of Defense. By creating a system that overcame the limitations of many existing navigation systems, GPS became attractive to a broad spectrum of users. GPS has been successful in classical navigation applications, and because its capabilities are accessible using small, inexpensive equipment, GPS has also been used in many new applications.

3. How GPS Works

GPS determines location by computing the difference between the time that a signal is sent and the time it is received. GPS satellites carry atomic clocks that provide extremely accurate time. The time information is placed in the codes broadcast by the satellite so that a receiver can continuously determine the time the signal was broadcast. The signal contains data that a receiver uses to compute the locations of the satellites and to make other adjustments needed for accurate positioning. The receiver uses the time difference between the time of signal reception and the broadcast time to compute the distance, or range, from the receiver to the satellite. The receiver must account for propagation delays, or decreases in the signal's speed caused by the ionosphere and the troposphere. With information about the ranges to three satellites and the location of the satellite when the signal was sent, the receiver can compute its own three-dimensional position.

An atomic clock synchronized to GPS is required in order to compute ranges from these three signals. However, by taking a measurement from a fourth satellite, the receiver avoids the need for an atomic clock. Thus, the receiver uses four satellites to compute latitude, longitude, altitude, and time.

4. The Parts of GPS

GPS comprises three segments: the space, control, and user segments. The space segment includes the satellites and the Delta rockets that launch the satellites from Cape Canaveral, in Florida. GPS satellites fly in circular orbits at an altitude of 20,100 km (12,500 mi) and with a period of 12 hours. The orbits are tilted to the earth's equator by 55 degrees to ensure coverage of polar regions. Powered by solar cells, the satellites continuous-

ly orient themselves to point their solar panels toward the sun and their antennae toward the earth. Each satellite contains four atomic clocks.

The control segment includes the master control station at Falcon Air Force Base in Colorado Springs, Colorado, and monitor stations at Falcon Air Force Base and on Hawaii, Ascension Island in the Atlantic Ocean, Diego Garcia Atoll in the Indian Ocean, and Kwajalein Island in the South Pacific Ocean. These stations monitor the GPS satellites. The control segment uses measurements collected by the monitor stations to predict the behavior of each satellite's orbit and clock. The prediction data is uplinked, or transmitted, to the satellites for transmission to the users. The control segment also ensures that the GPS satellite orbits and clocks remain within acceptable limits.

The user segment includes the equipment of the military personnel and civilians who receive GPS signals. Military GPS user equipment has been integrated into fighters, bombers, tankers, helicopters, ships, submarines, tanks, jeeps, and soldiers' equipment. In addition to basic navigation activities, military applications of GPS include target designation, close air support, "smart" weapons, and rendezvous.

With more than 500,000 GPS receivers, the civilian community has its own large and diverse user segment. Surveyors use GPS to save time over standard survey methods. GPS is used by aircraft and ships for en route navigation and for airport or harbor approaches. GPS tracking systems are used to route and monitor delivery vans and emergency vehicles. In a method called precision farming, GPS is used to monitor and control the application of agricultural fertilizer and pesticides. GPS is available as an in-car navigation aid and is used by hikers and hunters. GPS is also used on the Space Shuttle. Because the GPS user does not need to communicate with the satellite, GPS can serve an unlimited number of users.

5. GPS Capabilities

GPS is available in two basic forms: the standard positioning service (SPS) and the precise positioning service (PPS). SPS provides a horizontal position that is accurate to about 100 m (about 330 ft); PPS is accurate to about 20 m (about 70 ft). For authorized users – normally the United States

military and its allies – PPS also provides greater resistance to jamming and immunity to deceptive signals.

Enhanced techniques such as differential GPS (DGPS) and the use of a carrier frequency processing have been developed for GPS. DGPS employs fixed stations on the earth as well as satellites and provides a horizontal position accurate to about 3 m (about 10 ft). Surveyors pioneered the use of a carrier frequency processing to compute positions to within about 1 cm (about 0.4 in). SPS, DGPS, and carrier techniques are accessible to all users.

The availability of GPS is currently limited by the number and integrity of the satellites in orbit. Outages due to failed satellites still occur and affect many users simultaneously. Failures can be detected immediately and users can be notified within seconds or minutes depending on the user's specific situation. Most repairs are accomplished within one hour. As GPS becomes integrated into critical operations such as traffic control in the national airspace system, techniques for monitoring the integrity of GPS on-board and for rapid notification of failures are being developed and implemented.

6. The Future of GPS

As of March 1994, 24 GPS satellites were in operation. Replenishment satellites are ready for launch, and contracts have been awarded to provide satellites into the 21st century. GPS applications continue to grow in land, sea, air, and space navigation. The ability to enhance safety and to decrease fuel consumption will make GPS an important component of travel in the international airspace system. Airplanes will use GPS for landing at fogbound airports. Automobiles will use GPS as part of intelligent transportation systems. Emerging technologies will enable GPS to determine not only the position of a vehicle but also its altitude.

True or false?

1. GPS is space-based radio-navigation system which provides users with accurate information about their position and velocity anywhere in world. 2. The receiver uses three satellites to compute position, altitude and time. 3. GPS comprises four segments – the space, time, control and user segments. 4. The orbits of the satellites are tilted to the earth poles by 55 de-

grees to insure coverage of equatorial areas. 5. The availability of GPS is currently limited by the number and integrity of the satellites in orbit. 6. GPS is available in three basic forms: the standard positioning service (SPS) and the precise positioning service (PPS) and the global positioning service (GPS). 7. The availability of GPS is currently limited by the number and integrity of the satellites in orbit.

Text 14. COMMUNICATION SYSTEM

In telecommunication, a communications system is a collection of individual communications networks, transmission systems, relay stations, tributary stations, and data terminal equipment (DTE) usually capable of interconnection and interoperation to form an integrated whole. The components of a communications system serve a common purpose, are technically compatible, use common procedures, respond to controls, and operate in unison. Telecommunications is a method of communication (e.g., for sports broadcasting, mass media, journalism, etc.).

A communications subsystem is a functional unit or operational assembly that is smaller than the larger assembly under consideration. Examples of communications subsystems in the Defense Communications System (DCS) are (a) a satellite link with one Earth terminal in CONUS and one in Europe, (b) the interconnect facilities at each Earth terminal of the satellite link, and (c) an optical fiber cable with its driver and receiver in either of the interconnect facilities.

Communication subsystem (b) basically consists of a receiver, frequency translator and a transmitter. It also contains transponders and other transponders in it and communication satellite communication system receives signals from the antenna subsystem.

An optical communication system is any form of telecommunication that uses light as the transmission medium. Optical communications consists of a transmitter, which encodes a message into an optical signal, a channel, which carries the signal to its destination, and a receiver, which reproduces the message from the received optical signal. Fiber-optic com-

munication systems transmit information from one place to another by sending light through an optical fiber. The light forms an electromagnetic carrier wave that is modulated to carry information. First developed in the 1970s, fiber-optic communication systems have revolutionized the telecommunications industry and played a major role in the advent of the Information Age. Because of its advantages over electrical transmission, the use of optical fiber has largely replaced copper wire communications in core networks in the developed world.

A radio communication system ping pong is composed of several communications subsystems that give exterior communications capabilities. A radio communication system comprises a transmitting conductor in which electrical oscillations or currents are manz produced and which is arranged to cause such currents or oscillations to be propagated through the free space medium from one point to another remote there from and a receiving conductor at such distant point adapted to be excited by the oscillations or currents propagated from the transmitter.

Power line communications systems operate by impressing a modulated carrier signal on the wiring system. Different types of power line communications use different frequency bands, depending on the signal transmission characteristics of the power wiring used. Since the power wiring system was originally intended for transmission of AC power, the power wire circuits have only a limited ability to carry higher frequencies. The propagation problem is a limiting factor for each type of power line communications.

A duplex communication system is a system composed of two connected parties or devices which can communicate with one another in both directions.

The term duplex is not used when describing communication between more than two parties or devices. Duplex systems are employed in nearly all communications networks, either to allow for a communication "two-way street" between two connected parties or to provide a "reverse path" for the monitoring and remote adjustment of equipment in the field.

A tactical communications system is a communications system that (a) is used within, or in direct support of, tactical forces, (b) is designed to meet the requirements of changing tactical situations and varying environmental conditions, (c) provides securable communications, such as voice, data, and video, among mobile users to facilitate command and control within, and in support of, tactical forces, and (d) usually requires extremely short installation times, usually on the order of hours, in order to meet the requirements of frequent relocation.

Comprehension check-up:

1) What is a communications system in telecommunication?
2) What does a communications subsystem basically consist of?
3) What facilities does an optical communication system use?
4) What do optical communications consist of?
5) When were fiber-optic communication systems developed?
6) What contribution have fiber-optic communication systems made in the telecommunications industry?
7) What subsystems does a radio communication systeming pong comprise?
8) What was the power wiring system originally intended for?
9) Do the power wire circuits have only a limited ability to carry higher frequencies?
10) Is the term duplex used when describing communication between more than two parties or devices?

Text 15. FERMAT'S LAST THEOREM

Pierre de Fermat was born in Toulouse in 1601 and died in 1665. Today we think of Fermat as a number theorist, in fact as perhaps the most famous number theorist who ever lived.

The history of Pythagorean triples goes back to 1600 B.C, but it was not until the seventeenth century A.D that mathematicians seriously attacked, in general terms, the problem of finding positive integer solutions to the equation $x^n + y^n = z^n$. Many mathematicians conjectured that there

are no positive integer solutions to this equation if n is greater than 2. Fermat's now famous conjecture was inscribed in the margin of his copy of the Latin translation of Diophantus's Arithmetica. The note read: "To divide a cube into two cubes, a fourth power or in general any power whatever into two powers of the same denomination above the second is impossible and I have assuredly found an admirable proof of this, but the margin is too narrow to contain it".

Despite Fermat's confident proclamation the conjecture, referred to as "Fermat's last theorem" remains unproven. Fermat gave elsewhere a proof for the case n = 4. it was not until the next century that L. Euler supplied a proof for the case n = 3, and still another century passed before A. Legendre and L. Dirichlet arrived at independent proofs of the case n = 5. Not long after, in 1838, G. Lame established the theorem for n = 7. In 1843, the German mathematician E. Kummer submitted a proof of Fermat's theorem to Dirichlet. Dirichlet found an error in the argument and Kummer returned to the problem. After developing the algebraic "theory of ideals", Kummer produced a proof for "most small n". Subsequent progress in the problem utilized Kummer's ideals and many more special cases were proved. It is now known that Fermat's conjecture is true for all n < 4.003 and many special values of n, but no general proof has been found.

Fermat's conjecture generated such interest among mathematicians that in 1908 the German mathematician P. Wolfskehl bequeathed DM 100.000 to the Academy of Science at Gottingen as a prize for the first complete proof of the theorem. This prize induced thousands of amateurs to prepare solutions, with the result that Fermat's theorem is reputed to be the maths problem for which the greatest number of incorrect proofs was published. However, these faulty arguments did not tarnish the reputation of the genius who first proposed the proposition – P. Fermat.

Comprehension check-up

Task 1. Answer the following questions.

a. How old was Pierre Fermat when he died?
b. Which problem did mathematicians face in the 17 century A.D?
c. What did many mathematicians conjecture at that time?
d. Who first gave a proof to Fermat's theorem?

e. What proof did he give?

f. Did any mathematicians prove Fermat's theorem after him? Who were they?

Task 2. Are the statements True (T) or False (F)? Correct the false sentences.

a. The German mathematician E. Kummer was the first to find an error in the argument.

b. With the algebraic "theory of ideals" in hand, Kummer produced a proof for "most small n" and many special cases.

c. A general proof has been found for all value of n.

d. The German mathematician P. Wolfskehl won DM 100.000 in 1908 for the first complete proof of the theorem.

Task 3. Discussion

Discuss in groups the following question.

What is the famous Fermat's theorem you've known?

Text 16. INEQUALITIES

An inequality is simply a statement that one expression is greater than or less than another. We have seen the symbol a > b, which reads "a is greater than b" and a< b, which reads "a is less than b". There are many ways in which to make these statements. For example, there are three ways of expressing the statement "a is greater than b":

- a > b or b < a
- a – b > 0 ; a – b is a positive number.
- a – b = n ; n is a positive number.

If an expression is either greater than or equal to, we use the symbol ≥, and similarly, ≤ states is less than or equal to. Two inequalities are alike in sense, or of the same sense, if their symbols for inequality point in the same direction. Similarly, they are unalike, or opposite in sense, if the symbols point in opposite directions.

In discussing inequalities of algebraic expressions we see that we can have two classes of them:

1. If the sense of inequality is the same for all values of the symbols for which its members are defined, the inequality is called an absolute or unconditional inequality.

   Illustrations: $x^2 + y^2 > 0$, x # 0 or y # 0

   $\pi < 4$

2. If the sense of inequality holds only for certain values of the symbols involved, the inequality is called a conditional inequality.

   Illustrations: $x + 3 < 7$, true only for values of x less than 4;

   $x^2 + 6 < 5x$, true only for x between 2 and 3.

The inequality symbols are frequently used to denote the values of a variable between given limits. Thus, $1 \leq x < 4$, states "values of x from 1, including 1, to 4 but not including 4", i.e., x may assume the value 1 and from 1 to 4 but no others. This is also called "defining the range of values".

$$x^2 + 6 < 5x \text{ for } 2 < x < 3$$

Properties:

a. The sense of an inequality is not changed if both members are increased or decreased by the same number.

If $a > b$, then $a + x > b + x$ and $a - x > b - x$

b. If $a > b$ and $x > 0$, then: $ax > bx$ and $a/x > b/x$

c. If $a > b$ and $x < 0$, then: $ax < bx$ and $a/x < b/x$

d. If a , b and n are positive numbers and $a > b$, then: $a^n > b^n$ and $\sqrt[n]{a} > \sqrt[n]{b}$

e. If $x > 0$, $a > b$ and a, b have like signs, then: $x/a<x/b$

We can illustrate these properties by using numbers.

Illustrations:

(1) Since $4 > 3$, we have $4 + 2 > 3 + 2$ as $6 > 5$

(2) Since $4 > 3$, we have $4(2) > 3(2)$ as $8 > 6$

(3) Since $4 > 3$, we have $4(-2) < 3(-2)$ as $-8 < -6$

(4) Since $16 > 9$, we have $\sqrt{16} > \sqrt{9}$ as $4 > 3$

(5) Since $4 > 3$, we have $2/4 < 2/3$ as $1/2 < 2/3$

The solutions of inequalities are obtained in a manner very similar to that of obtaining solutions to equations. The main difference is that we are now finding a range of values of the unknown such that the inequality is satisfied. Furthermore, we must pay strict attention to the properties so that in performing operations we do not change the sense of inequality without knowing it.

Comprehension check-up

Task 1. Answer the questions.

a. What is an inequality in maths?

b. What does the following mean: a > b?

c. Which symbol do we use to signify an expression "is either greater than or equal to"?

d. When are two inequalities like or unlike in sense?

e. Do you know any kinds of inequality?

Task 2. Writing

State the expression " a is greater than b " in different ways.

Task 3. Work in pairs

Illustrate 5 properties of inequality by using number.

(1) Since 4 > 3, we have 4 + 2 > ..... .

(2) Since 4 > 3, we have .....… .

(3) Since 4 > 3, we have .....… .

(4) Since 16 > 9, we have .....… .

(5) Since 4 > 3, we have .....….. .

Task 4. Sometimes you see problems expressed like this:

$$7x - 3 > 2x + 7$$

Solution: Using the properties we write in turn:

$$7x - 3 > 2x + 7$$

$$7x - 2x > 7 + 3$$

$$5x > 10$$

$$x > 2$$

The solution, then, is all values of x greater than 2.

Which properties do you use to solve the problem?

Text 17. THE PYTHAGOREAN PROPERTY

The ancient Egyptians discovered that in stretching ropes of lengths 3 units, 4 units and 5 units as shown below, the angles formed by the shorter ropes is a right angle (Fig. 1). The Greeks succeeded in finding other sets of three numbers which gave right triangles and were able to tell without drawing the triangles which ones should be right triangles, their method being as follow. If you look at the illustration you will see a triangle with a dashed interior (Fig. 2).

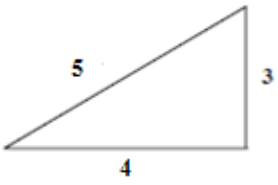


Fig. 1

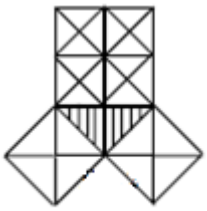


Fig. 2

Each side of it is used as the side of a square. Count the number of small triangular regions in the two smaller squares then compare with the number of triangular regions in the largest square. The Greek philosopher and mathematician Pythagoras noticed the relationship and was credited with the proof of this property. Each side of right triangle was used as a side of a square, the sum of the areas of the two smaller squares is the same as the area of the largest square.

Proof of the Pythagorean Theorem

We would like to show that the Pythagorean Property is true for all right angle triangles, there are several proofs of this property.

Let us discuss one of them. Before giving the proof let us state the Pythagorean Property in mathematical language. In the triangle (Fig. 3), c represents the measure of the hypotenuse, and a and b represent the measures of the other two sides. If we construct squares on the three sides of the triangle, the area – measure will be a^2, b^2 and c^2. Then the Pythagorean Property could be stated as follows: $c^2 = a^2 + b^2$. This proof will involve working with areas. To prove that $c^2 = a^2 + b^2$ for the triangle above, construct two squares each side of which has a measure a + b as shown in fig. 4 and fig. 5.

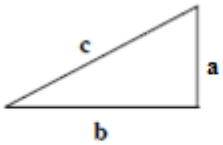


Fig. 3

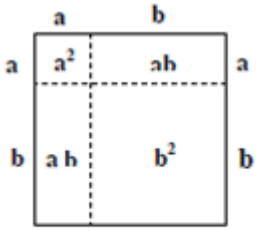


Fig. 4

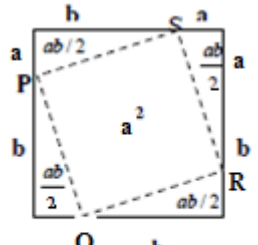


Fig. 5

Separate the first of the two squares into two squares and two rectangles as shown in fig. 4. Its total area is the sum of the areas of the two squares and two rectangles.

$$A = a^2 + 2ab + b^2$$

In the second of two squares construct four right triangles as shown in figure 5. Are they congruent? Each of the four triangles being congruent to the original triangle, the hypotenuse has a measure c. It can be shown that PQRS is a square, and its area is c^2. The total area of the second square is the sum of the areas of the four triangles and the square PQRS.

$$A = c^2 + 4\ (1/2ab)$$

The two squares being congruent to begin with, their area measures are the same. Hence we may conclude the following:

$$a^2 + 2ab + b^2 = c^2 + 4\ (1/2ab)$$

$$(a^2 + b^2) + 2ab = c^2 + 2ab$$

By subtracting 2ab from both area measures we obtain $a^2 + b^2 = c^2$ which proves the Pythagorean Property for all right triangles.

Comprehension check-up

Task 1. Which sentences in the text answer these questions.

a. Could the ancient Greeks tell the actual triangles without drawing? Which ones would be right triangles?

b. Who noticed the relationship between the number of small triangular regions in the two smaller squares and in the largest square?

c. Is the Pythagorean Property true for all right triangles?

d. What must one do to prove that $c^2 = a^2 + b^2$ for the triangle under consideration?

e. What is the measure of the hypotenuse in which each of the four triangles is congruent to the original triangle?

Task 2. Choose the main idea of the text.

a. The Pythagorean theorem is true for all right triangles and it could be stated as follows: $c^2 = a^2 + b^2$.

b. The text shows that the Pythagorean Property is true for all right triangles.

c. The Greek mathematician, Pythagoras contributed to maths history his famous theorem which was proved to be true for all right triangles.

Task 3. Speaking

Work in pairs. Prove the Pythagorean Theorem using numbers.

Text 18. The coordinate plane

Now we want you to consider two sets: A and B, such that A = {a, b, c} and B = {d, e}. We will form a new set from sets A and B, which we will call the Cartesian product, or simply the product set, by forming all possible ordered pairs (x, y) such that x is from set A and y is from set B. This new set is denoted by A × B (read A cross B).

$$A \times B = \begin{Bmatrix} (a,d)\ ,\ (a,e) \\ (b,d)\ ,\ (b,e) \\ (c,d)\ ,\ (c,e) \end{Bmatrix}$$

Let us use the notation n (A) to mean the number of elements in set A and n (A × B) to mean the number of elements (ordered pairs) in A × B. Observe that n (A × B) = 6 and that n (A) = 3 and n (B) = 2. Since 3 × 2 = 6, we see there is a relationship of some importance between the set operation of forming the Cartesian product and multiplication of numbers n (A) × n (B) = n (A × B). Now let us form B × A.

$$B \times A = \begin{Bmatrix} (d,a)\ ,\ (d,b)\ ,\ (d,c) \\ (e,a)\ ,\ (e,b)\ ,\ (e,c) \end{Bmatrix}$$

You may have noticed that no elements (ordered pairs) of B × A are the same as those of A × B, though their numbers are still the same. This means that A × B # B × A, while n (A) × n (B) = n (B) × n (A). Forming

the product set is a non-commutative operation. In this case it is a non-commutative multiplication.

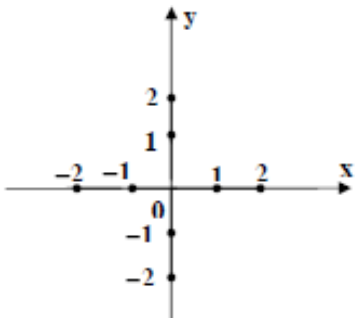
In our next step we do something that at first will seem purposeless. Given that set A = {a, b, c} , we will form the new set A × A .

$$A \times A = \begin{Bmatrix} (a,a) , (a,b) , (a,c) \\ (b,a) , (b,b) , (b,c) \\ (c,a) , (c,b) , (c,c) \end{Bmatrix}$$

This is, of course, the Cartesian product of set A with itself, and you will wonder what you can do with it. Its use will become clear if we let X = {0, 1, 2} and let Y = {0, 1, 2} . Then find X = Y the Cartesian product of a set with itself since X = Y.

$$X \times Y = \begin{Bmatrix} (0,0) , (0,1) , (0,2) \\ (1,0) , (1,1) , (1,2) \\ (2,0) , (2,1) , (2,2) \end{Bmatrix}$$

We then interpret this set of ordered pairs of numbers as a set of points in a plane such that to each point there corresponds one ordered pair of numbers and vice versa. Now it is necessary for us to set up a model for geometric interpretation. To do this we intersect two number lines at the zero point, or origin of the graph, so that the lines are perpendicular to each other. Label the number lines as shown in the following figure by choosing X to denote the set of points on the horizontal line and Y to denote the set of points on the vertical line. Now we assign positive numbers to the right half line of X and negative numbers to the left half line of X. Similarly we assign positive numbers to the upper half line of Y and negative numbers to its lower half line. The two number lines are called axes. We speak of the x axis when we refer to the horizontal number line and of the y axis when we refer to the vertical number line. We now have an interpretation such that every ordered pair of numbers labels a point in the plane determined by the X and Y axes.



Since we find each of the axes to represent an ordered set of points and both axes to cooperate in determining the plane, such a system is said to be a coordinate system and the plane determined by it is said to be a co-ordinate plane. Each ordered pair (x, y) tells you how to locate a point in the coordinate plane, by starting from the origin. (x, y) means: first move x units from (0, 0) along the x axis to the right or left (indicated by + or – preceding the first numeral of the pair); then move y units from that point parallel to the
y axis (up or down as indicated by + or – preceding the second numeral of the pair).

Comprehension check-up

a. What are the two number lines as we have used them for the coordinate systems called?
b. What is the horizontal number line often referred to?
c. What is the vertical number line often referred to?
d. Into how many parts do the two axes of the coordinate system divide the plane?
e. If both coordinates of a point are 0, where is the point located?
f. What does a coordinate of a point tell you?
g. What does each of the axes represent?

Part II
TEXTS FOR READING AND TRANSLATION

Text 1. THE WORLD WIDE WEB

Until the appearance of the World Wide Web (WWW), the Internet was mainly used by people who had some computer expertise. File transfer protocol (FTP) was the standard method by which data could be stored on or removed from a server, and if a document that had been transmitted had references to other documents then it was not straightforward to access them. In other words, FTP does not link separate documents together.

In 1992, Tim Berners-Lee, working at Europe's high-energy physics research center in Switzerland, wrote the first browser which used a protocol called hypertext transfer protocol (HTTP). This operates as follows: when a client requests a Web server to send a document, the request is sent using HTTP (rather than FTP). The Web server finds the document in its memory and transmits it along with extra information. Is it this information that distinguishes a Web server from an Internet server. The extra information transmitted is composed of two main parts: * control codes, using hypertext markup language (HTML), by which the client computer screen can display the document, i.e. layout, headings, bordering, etc. Images can be transmitted as separate files and incorporated on the visible page by HTML code.* links to other documents these links are specific words or phrases in the text of the transmitted document that will allow related documents to be accessed.

When the mouse pointer of the client is moved over the document on the screen, the arrow changes to a hand with a pointing finger whenever it fall on any hypertext. If the user clicks on this link, the browser will automatically set up the link address and request the appropriate Web server to transmit the new document to the client. When the new document arrives, it is displayed on the screen.

A browser, therefore, is a program, stored in the client's computer, that is able to read hypertext. While the Internet is the huge collection of computer networks and databases connected by backbone cable and optic

fiber, the WWW is essentially a browsing and searching system. It allows users with virtually no expertise to access the information stored at certain sites on the Internet.

Text 2. SYSTEM INTEGRATION IN DIGITAL LIBRARIES

Digital libraries can be viewed as infrastructures for supporting the creation of information sources, facilitating the movement of information across global networks, and allowing the effective and efficient interaction among knowledge producers, librarians and information and knowledge seekers. Typically, a digital library is a vast collection of objects stored and maintained by multiple information sources, including databases, image banks, file systems, email systems, the Web and other methods and formats. Often, these information sources are heterogeneous**, in terms of how the objects are stored, organized and managed, and the platforms on which they reside. Moreover, the information sources are dynamic in the sense they may be either included in or removed from the digital library system. Furthermore, digital libraries are composite*** multimedia objects comprising different media components including text, video, images, or audio. Therefore, the challenge is to provide users with the ability to seamlessly and transparently access to digital library objects in spite of the heterogeneity and dynamism among the information sources, and the composite multimedia nature of the objects. To accomplish this, the problem of heterogeneity and SI must first be resolved.

Although there have been several techniques proposed by the research community, especially the database and agent communities, these techniques cannot be easily adapted to digital library environments. This is because, while database integration primarily deals with structured textual data, SI in digital libraries requires the ability to deal with massive amount of multimedia objects.

Notes

**heterogeneous – разнородный

***composite – составной, комбинированный

Text 3. ARTIFICIAL INTELLIGENCE

Artificial Intelligence is the science and engineering of making intelligent machines, especially intelligent computer programs. The task of this science of using computers to understand human intelligence, but AI has not to limit itself to the methods that are biologically observable.

Intelligence is the computational part of the ability to achieve goals in the world. Different kinds and degrees of intelligence occur in people, many animals and some machines.

There is no a solid definition of intelligence that doesn't depend on relating it to human intelligence. The problem is that we cannot yet characterize in general what kinds of computational procedures may be called intelligent. We understand some of the mechanisms of intelligence and not others.

As we said, intelligence involves mechanisms, and AI research has discovered how to make computers carry out some of them and not others. If doing some tasks requires only mechanisms that are well understood today, computer programs can give very impressive performances on these tasks. Such programs should be considered "somewhat intelligent”

Sometimes AI can simulate a human intelligence, but usually not. On the one hand, we can learn something about how to make machines solve problems by observing other people or our own methods. But on the other hand, most AI work needs studying the problems that the world presents to intelligence rather than studying people or animals. In studying these world problems AI researchers more often use methods that involve much more computing than people can do.

Computer programs do not have IQ. IQ is based on the rates at which intelligence develops in children. Later, the scale of IQ is extended to adults. It correlates well with the degree of various measures of success or failure in life. But making computers that can compete with humans score high on IQ tests would be a useless thing. For example, the ability of a child to repeat back a long sequence of digits depends on its other correlates well with other intellectual abilities, perhaps because it measures how

much information the child can compute with at once. However, the same digit task is trivial for even extremely limited computers.

However, some of the problems on IQ tests are useful challenges for AI. Some scientists suggest that all normal humans have the same intellectual and physiological conditions". The difference in intelligence is expressed in differences in speed, short-term memory, and the ability to form accurate and retrievable long-term memories.

As to computer programs, they have plenty of speed and memory, but their abilities correspond to the intellectual mechanisms that program designer understands well enough to put in programs. The problem is that cognitive sciences still have not succeeded in determining exactly what the human abilities are. It is likely that organization of the intellectual mechanisms for AI can be different from that in people.

Text 4. ANTI-VIRUS SOFTWARE AND OTHER PREVENTATIVE COUNTERMEASURES

There are two common methods to detect viruses. The first, and by far the most common method of virus detection is using a list of virus signature definitions. The second method is to use a heuristic algorithm to find viruses based on common behaviors. This method has the ability to detect viruses that anti-virus security firms have yet to create a signature for.

Many users install anti-virus software that can detect and eliminate known viruses after the computer downloads or runs the executable. They work by examining the content heuristics of the computer's memory (its RAM, and boot sectors) and the files stored on fixed or removable drives (hard drives, floppy drives), and comparing those files against a database of known virus "signatures". Some anti-virus programs are able to scan opened files in addition to sent and received emails 'on the fly' in a similar manner. This practice is known as "on-access scanning." Anti-virus software does not change the underlying capability of host software to transmit viruses. There have been attempts to do this but adoption of such anti-virus solutions can void the warranty for the host software. Users must therefore

update their software regularly to patch security holes. Anti-virus software also needs to be regularly updated in order to gain knowledge about the latest threats.

One may also prevent the damage done by viruses by making regular backups of data (and the Operating Systems) on different media, that are either kept unconnected to the system (most of the time), read-only or not accessible for other reasons, such as using different file systems. This way, if data is lost through a virus, one can start again using the backup (which should preferably be recent). If a backup session on optical media like CD and DVD is closed, it becomes read-only and can no longer be affected by a virus. Likewise an operating system on an operating system on a live CD can be used to start the computer if the installed Operating Systems become unusable. Another method is to use different operating systems on different file systems. A virus is not likely to affect both. Data backups can also be put on different file systems. For example, Linux requires specific software to write to NTFS partitions, so if one does not install such software and uses a separate installation of MS Windows to make the backups on an NTFS partition (and preferably only for that reason), the backup should remain safe from any Linux viruses. Likewise, MS Windows can not read file systems like EXT3, so if one normally uses MS Windows, the backups can be made on an EXT3 partition using a Linux installation.

Once a computer has been compromised by a virus, it is usually unsafe to continue using the same computer without completely reinstalling the operating system. However, there are a number of recovery options that exist after a computer has a virus. These actions depend on severity of the type of virus.

Text 5. RADIO WAVES

Radio waves are known to be general means of data transport in communication engineering. Radio waves were reported to be discovered by Henry Hertz in 1887. He was conducting experiments in his laboratory: two spheres were placed on the top of two rods and charged oppositely, the

scientist observed a spark between them. Close to those spheres there was placed another piece of wire with neutrally charged spheres on its ends. Hertz could see a spark between them too. This strange phenomenon proved that radio waves really existed.

In Russia there were conducted experiments in order to discover radio waves. Alexander Popov succeeded in developing a device which proved the existence of radio waves. It was a lightning detector which determined the stroke of lightning. All these experiments justified ability of radio waves to be transmitted in the open field without special conducting means (wires).

When alternating current passes through a piece of wire, electromagnetic field is produced around it. This electromagnetic field fluctuates according to changes in electric current. The fluctuations can spread to great distance very quickly, their speed being close to light speed (about 300000 km/s). If there is a piece of wire or an aerial in the distance, it can receive these fluctuations. Data transportation takes place. Hence, radio waves are a form of electromagnetic radiation, created whenever a charged object (in normal radio transmission, an electron) accelerates with a frequency that lies in the radio frequency (RF) portion of the electromagnetic spectrum. In radio, this acceleration is caused by an alternating current in an antenna. Radio is the wireless transmission of signals, by modulation of electromagnetic waves with frequencies below those of visible light.

Radio waves have specific features: frequency and period. Fluctuation frequency of a radio wave *f Hz* is a number of fluctuations per a unit of time. Fluctuation period *T sec* is a time of one full fluctuation. Radio waves are divided according to the frequency range:

Low-frequency with fluctuation rate is about 30 kHz – 300 kHz;

Mid range – about 300 kHz – 3 MHz

High frequency – over 3 MHz

Radio frequencies occupy the range from a few tens of hertz to three hundred gigahertz, although commercially important uses of radio use only a small part of this spectrum.

To transmit data there are used special wave bands because wave transmission of certain frequency depends greatly from surrounding environment and noises. That is why radio waves are usually classified according to the following wave bands: long (kilometric) waves, medium (hectometric) waves, short waves, ultrashort waves (UHF), metric waves, microwaves, centimetric (infrared) waves, millimetric (visible light) waves, and submillimetric (X-rays and gamma rays) waves. Since the energy of an individual photon of radio frequency is too low to remove an electron from an atom, radio waves are classified as non-ionizing radiation.

One can often hear of radio waves in our everyday life. The most common example of receiving and transmitting radio waves is cellular phones. Radio waves help to transmit data from satellites to TV system and broadcast system. Even micro ovens (or SHF – Super High Frequency ovens) in our kitchens use radio waves to warm food.

GLOSSARIES TO THE TEXTS

Information Technology

ABET (Accreditation Board for Engineering and Technology) – Комиссия по аккредитации в сфере инженерии и технологий (некоммерческая организация, занимающаяся аккредитацией учебных заведений, дающих образование в сфере прикладных наук и компьютерных технологий)

ACM (Association for Computing Machinery) – Ассоциация по вычислительной технике

ICT (Information and Communication Technologies) – информационные и коммуникационные технологии, информационно-коммуникационные технологии, ИКТ (термин, широко используемый вместо или как расширение термина information technology)

IT (Information technology) – информационные технологии

ITAA (Information Technology Association of America) – Американская ассоциация по информационным технологиям

SIGITE (Special Interest Group for Information Technology Education) – специальная группа в составе Ассоциации по вычислительной технике, занимающаяся вопросами образования в сфере информационных технологий
balloon – раздуваться, увеличиваться
claim – заявка, утверждение (часто спорное)
convergence – математическая конвергенция, схождение в одной точке, сближение
curriculum – учебная программа, учебный план
disseminate – распространять
economy – (здесь) система, структура
encompass – охватывать, заключать
get over – преодолевать
implementation – исполнение, реализация
ontologically – (здесь) по своему происхождению, бытованию
presumably – предположительно, вероятно, по-видимому
prevalent – распространенный, общепринятый, преобладающий
umbrella term – широкий (всеохватный) термин

Data Security Technologies (Part I)

biometric technology – биометрическая технология
controller – контроллер; устройство управления; регулятор
corruption – изменение, искажение (информации, текста)
cryptographic keys – криптографические ключи
digital signature – цифровая подпись
disk encryption – шифрование на диске
dongles – защитная заглушка
fingerprint – отпечаток пальца
hard disk drive – накопитель на жестком диске, дисковод
key fob – брелок
keychain – брелок
keypad – (малая) клавишная панель; (малая) клавиатура
OTFE (on-the-fly encryption) – мгновенное шифрование

peripheral device – периферийное устройство
PIN (Personal Identification Number) – личный идентификационный номер
PKCS (Public Key Cryptography Standard) – криптографический стандарт с общим ключом
privacy – секрет, секретность
privilege level – уровень привилегий
RFID (Radio Frequency Identification) – радиочастотная идентификация
security tokens – маркер доступа
two factor authentication – двухфакторная аутентификация
USB (Universal Serial Bus) – универсальная последовательная шина

Data Security Technologies (Part II)

back up – выполнять резервное копирование
constant patch – постоянное соединение
data erasure – стирание данных
data loss – потеря данных
data masking – маскирование данных
data recovery – восстановление данных
data storage – запоминание (хранение) данных
database layout – размещение базы данных
degaussing – стирать магнитную запись, размагничивать
digital media – цифровая запоминающая среда
file defection – удаление файла
hacking – хакерство
identity theft – «кража личности»
leaking – утечка информации
non-production database – непроизводственная база данных
portability – мобильность
spill – вытеснение, откачка, сброс

Malware

adware – бесплатный программный продукт с размещенной в нём рекламой
catch-all phrase – расплывчатое понятие
executable software – выполняемая программа
hostile, intrusive or annoying software – враждебное, навязчивое или раздражающее ПО
infiltrate / to damage computer system – проникать в / повреждать компьютерную систему
informed consent – добровольное согласие
intent – намерение, цель
malicious – злой, злоумышленный
misunderstand the distinction – неправильно понимать разницу
recipient – реципиент, получатель
spyware – ПО, предназначенное для слежения за действиями пользователя на компьютере. Перехватывает его почтовую переписку, вводимую им информацию, пароли и команды

Communication Systems

broadcasting – 1) транслирование; 2) широкая рассылка
communication satellite – связной спутник
communications systems – система передачи информации, сеть связи
CONUS (Continental United States) – континентальная часть США
core networks – базовая сеть
DCS (Defense Communications System) – Система связи Министерства обороны
DTE (data terminal equipment) – терминальное оборудование
duplex communication system – одновременная двухсторонняя связь
electrical transmission – электрическая трансмиссия
electromagnetic carrier wave – электромагнитная несущая волна
fiber-optic communication systems – волоконно-оптические системы связи
frequency translator – блок транспонирования частоты

functional unit – функциональное устройство; функциональный блок
Information Age – эра информации
interconnection – внутреннее соединение
interoperation – совместимость, взаимодействие
modulate – регулировать, модулировать
operational assembly – операционный блок, узел
optical communication system – система оптической связи
optical fiber cable – волоконно-оптический кабель
power line communications systems – системы передачи информации по электрическим сетям
relay station – ретрансляционная станция
satellite link – линия спутниковой связи
tactical communications system – система связи тактического назначения
tactical forces – войска оперативно-тактического назначения
telecommunication – дистанционная связь; дистанционная передача данных
transmission – 1) передача; 2) прохождение (например сигнала)
transponders – транспондер, преобразователь непрерывных данных в цифровые
tributary station – станция в многопунктовой сети

ЗАКЛЮЧЕНИЕ

В учебном пособии был представлен материал профессиональной направленности, позволяющий развить навыки профессионально-ориентированной устной речи. С этой целью использовались разные виды заданий, направленные на проверку понимания прочитанного по рассмотренным темам.

Авторы пособия стремились адаптировать тексты для изучения на аудиторных занятиях; тексты сопровождаются отдельно вынесенной специализированной лексикой. Материал изложен в доступной форме и знакомит с основными видами профессиональной деятельности, расширяет словарный запас за счет овладения современной терминологией.

Авторы надеются, что при изучении пособия магистранты смогли активизировать знания, умения и навыки, полученные на ранних этапах изучения английского языка за счет тренировки в различных видах речевой деятельности.

Каждый текст был ориентирован на выработку и тренировку основных языковых навыков – говорения, восприятия на слух, чтения и письма с акцентом на устную речь и ее понимание.

Авторы надеются, что издание оказалось полезным для магистрантов, занимающихся иностранным языком в сфере профессиональной компетенции.

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