Е.И. Изотова

COMPUTER SOFTWARE ENGINEERING

Учебно-методическая разработка по развитию иноязычной (английский язык) профессиональной компетенции

Тверь 2012

Предназначено для студентов, обучающихся по направлению подготовки специалистов «Программное обеспечение вычислительной техники»(230105) и «Информационно-вычислительная техника»(230100), а также круга людей, интересующихся вопросами в данной сфере.

Ставит целью обучить студентов читать литературу по специальности и осуществлять коммуникацию на профессиональные темы.

TABLE OF CONTENTS

UNIT I. GENERAL ASPECTS OF SOFTWARE ENGINEERING

Vocabulary

Advertizing Letter – рекламное письмо

amplify – расширять, увеличивать

application – просьба, приложение

appropriate – подходящий,

atomization – распыление

attribute. – отличительная черта

automated teller machine –автокассир в банке

boilerplate – заготовка программного кода

cache - файл, используемый для хранения данных

craftsmanship - мастерство, умение

commercial mainframe – промышленная универсальная вычислительная машина

layer – слой, прокладка

licensing – лицензирование

logging – регистрация, сбор данных

make – сборка программы с перекомпиляцией измененных модулей

mature – зрелый

obedient – покорный, послушный

proven - доказанный, испытанный, опробованныйprovision –

quantifiable – поддающийся количественному определению

quarrel – ссора, ссориться

repository – база, хранилище

resume – краткая автобиография

rigor – точность, точный

computability – вычисляемость

confluence – слияние, соединение

Cover Letter – сопроводительное письмо

debugging - отладка программы, устранение ошибок

deduce – выводить, делать вывод

define - определять

embody - воплощать

emulate – конкурировать, соперничать

evolve - испускать, излучать, эволюционировать, развиваться

finite – ограниченный, имеющий предел

implication – последствие

Inquiry Letter – письмо-запрос

sequence - последовательность

scalability – расширяемость, масштабируемость

spark - искра

staunchly – стойко, непреклонно

summon – вызывать, созывать

template - модель, матрица

the First Amendment – первая поправка

ubiquitous – вездесущий, повсеместный

variable – переменный, меняющийся

warrant – гарантировать, служить основанием

workload – рабочая нагрузка

Pre-text exercises

Ex.1. Mind the rules of pronunciation.

[ai]: sight, life, style, derive, arise, combine, apply, rely, library, slide, side, flight;

[ei]: basic, behave, nature, maintain, contain, engage, debate, fake, occasional;
[ju:] human, pursue, communicate, acute, mutual, due, tube, computer, dispute;
[i]: complete, equal, feel, deal, people, beat, feet, field, conceal, meaning, increase;
[i]: practitioner, activity, distinct, since, traditional, condition, ubiquitous, distinguish;
[e]: intellectual, direction, expect, engineer, spread, development, extensive, depend;
[æ]: aspect, action, satisfaction, standard, practice, systematic, manager, advocate.

Ex.2. Form nouns or adjectives using the suffixes and translate them.
er: to transform, to own, to read, to teach, to realize, to organize, to manage, to compute, to contain;
or: to initiate, to operate, to protect, to invent, to direct, to process;
ion: to contribute, to invent, to consolidate, to demonstrate, to express, to estimate, to automate;
ment: to commit, to manage, to improve, to develop, to pay, to agree, to judge, to move;
ship: member, friend, partner, champion, author;
ful: beauty, meaning, harm, use, hope, help, success, color;
al: experiment, form, historic, industry, tradition, occasion, technology, practice.

Ex. 3. Choose the right variant.
1. Although each school in England decides its own…… , it must include certain compulsory subjects.
a) curriculum b) program c) academic training d) education
2. I`d like to …… to Lisa, our sales manager.
a) introduce b) assist c) meet d) visit
3. He asked the students to …. the unit of resistance more accurately.
a) amplify b) control c) respond d) define
4. An effective method of solving a problem by using a finite sequence of instructions is called …
a) measurement b) algorithm c) calculation d) identification
5. Many parents complain of their children`s … , but probably they were the same.
a) disobedience b) obedience c) obedient d) obey

Text I

Software Engineering

Software Engineering is the profession that creates and maintains software applications by applying technologies and practices from computer science, project management, computer engineering, application domains, and other fields. Software is the set of directions that enables computer hardware to perform useful work. In the last decades of the twentieth century, cost reductions in computer hardware led to

software becoming a ubiquitous component of the devices used by industrialized societies. Software engineering deals with issues of cost and reliability. Some software applications contain millions of lines of code that are expected to perform properly in the face of changing conditions. As of 2010, the U. S. Bureau of Labor Statistics counts over 600,000 computer software engineers in the U.S., and there are estimated to be about one-and-a-half million practitioners in Europe, Asia, and elsewhere. There is extensive debate about what Software Engineering is, who qualifies as a Software Engineer, who sets the standards, etc.

Debate over Who is a Software Engineer Some people believe that software development is a more appropriate term than software engineering for the process of creating software. The term implies levels of rigor and proven processes that are not appropriate for all types of software development. People go on making a strong case for craftsmanship as a more appropriate metaphor because it focuses on the skills of the developer as the key to success. Some people dispute the notion that the field is mature enough to warrant the title "engineering". In each of the last few decades, at least one radical new approach has entered the mainstream of software development implying that the field is still changing too rapidly to be considered an engineering discipline. Other people argue that the supposedly radical new approaches are actually evolutionary rather than revolutionary, the mere introduction of new tools rather than fundamental changes. There are currently no widely accepted criteria for distinguishing someone who is a software engineer.

Software Engineering today Software engineering affects economies and societies in many ways. Software engineering changes world culture, wherever people use computers. E-mail, the world-wide web, and instant messaging enable people to interact in new ways. Software lowers the cost and improves the quality of health-care, fire departments, and other important social services. Successful projects where software engineering methods have been applied include Linux, the space shuttle software, and automated teller machines. But in spite of the enormous economic growth and productivity gains enabled by software, persistent complaints about the quality remain. Deficient software engineering is often blamed for project failures when the blame might more properly be placed with business managers who ignore lessons already learned by Software Engineers. What is the best way to make more and better software? Software engineers advocate many different technologies and practices. Software engineers use a wide variety of technologies: compilers, code repositories, word processors to carry out and coordinate their efforts.

Ex.1. Read and translate the text, answer the questions.
1. What does software engineering create?
2. What is software engineering?
3. What issues does software engineering deal with?
4. What is a more appropriate term for a process of creating software?

5. Are there currently any widely accepted criteria for distinguishing someone who is a software engineer from someone who is not a software engineer?
6. How does software engineering affect economies and societies?
7. Do persistent complaints about the quality of software remain in spite of the enormous economic   growth and productivity gains?
8. What is deficient software engineering often blamed for?
9. What is the best way to make more and better software?
10. What do Software engineers use to carry out and coordinate their efforts?

Ex.2. Translate from English into Russian.
Computer science, project management, computer engineering, application domains; the set of directions; cost reductions; a ubiquitous component of the devices; issues of cost and reliability; widespread use; rigor and proven processes; the field is mature enough to warrant the title "engineering"; supposedly radical new approaches; evolutionary; to enable people to interact in new ways; persistent complaints; compilers, code repositories, word processors.

Ex.3. Find out the English equivalents in the text.
Разработка программного обеспечения; управление проектными работами; область применения; снижение стоимости; обычная составляющая устройств; надежность; многообразие различных значений; применение поддающегося количественному определению подхода; зрелая область, соответствовать названию техника; улучшать качество здравоохранения; компилятор; хранилища систем кодирования; текстовые процессоры.

Ex.4. Complete the sentences.
1. Software engineering is the profession…
2. Software is the set of directions…
3. Software engineering deals with
4. …applications contain millions of lines of code that are expected to perform properly…
5. Software engineering, like traditional engineering disciplines, deals with …
6. There are currently no widely accepted criteria for distinguishing someone who is …from someone who is not …
7. Software engineering affects …
8. E-mail, the world-wide web and instant messaging enable people to interact …
9. Deficient software engineering is often blamed for … …
10. Software engineers use a wide variety of technologies and practices: …to carry out and coordinate their efforts.

Ex.5. Choose the right word.

1. Software engineering is the … that creates and maintains software applications by applying technologies and practices from computer science, project management, computer engineering, application domains, and other fields.
a) profession b) science c) research

2. Software engineering, like traditional engineering disciplines, deals with … of cost and reliability.
a) questions b) issues c) items

3. There is extensive … about what SE is, who qualifies as an SE, who sets the standards, etc.
a) argument b) quarrel c) debate

4. Software engineering is the …of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software, that is, the application of engineering to software," and the study of approaches.
a) application b) provision c) suggestion

6. Some people dispute the … that the field is mature enough to warrant the title "engineering"
a) notion b) subject c) definition

7. Other people would argue that the supposedly radical new … are actually evolutionary rather than revolutionary, the mere introduction of new tools rather than fundamental changes.
a) viewpoints b) approaches c) methods

8. Software engineering changes world culture, wherever people use computers. Email, the world-wide web, and instant messaging enable people … in new ways.
a) to work b) to interact c) to write

9. Successful projects where software … methods have been applied include Linux, the space shuttle software, and automated teller machines.
a) technical b) engineering c) programming

10. Software engineers advocate many different … and practices.
a) technologies b) skills c) theories

Ex.6. Match the English and Russian equivalents.

1. computer software engineering	a. текстовый процессор
2. application domain	b. кодификация рекомендованных правил
3. cost reductions	c. повсеместный компонент устройства
4. codification of recommended practices	d. снижение стоимости
5. to interact in new ways	e. точные и проверенные процессы
6. mature enough to warrant	f. разработка программного обеспечения

7. ubiquitous component of the devices   g. постоянные жалобы

8. rigor and proven processes   h. область применения

9. persistent complaints   i. взаимодействовать по-новому

10. word processor   j. достаточно зрелый, чтобы
                                           соответствовать

Ex.7. Complete the dialogue and learn it by heart.

Student A – Hi! Glad to meet you. I haven`t seen you for ages!

Student B – Hi! So am I! How are you?

Student A - … ! Where do study?

Student B - … … …

Student A – Oh! That`s great! And what is your future specialty?

Student B - … … …

Student A – And what is Software Engineering?

Student B – Software Engineering is … … …

Student A – How interesting! I always consider Software as a set of different programs.

Student B – That`s not so. Software is a set of directions … … …

Student A – When was the term "Software Engineering" used?

Student B - … … … It is used with a variety of meanings.

Student A – Really?

Student B – These meanings are … … …

Student A – What is Software Engineering today?

Student B – Software Engineering affects … … in many ways and changes … …

Student A – Oh! I see. Thank you for your conversation. Bye!

Student B – Bye! See you soon.

Text 2

The Nature of Software Engineering

Software engineering resembles many different fields in many different ways. The following paragraphs make some simple comparisons.

Programs have many mathematical properties. For example the correctness and complexity of many algorithms are mathematical concepts that can be rigorously proven. Programs are finite, so developers could know many things about a program in a rigorous mathematical way. The use of mathematics within software engineering is often called formal methods. However, computability theory shows that not everything useful about a program can be proven. Mathematics works best for small pieces of code and has difficulty scaling up.

Programs have many scientific properties (for example, the performance and scalability of programs under various workloads) that can be measured. The

effectiveness of caches, bigger processors, faster networks, newer databases is a scientific issue.

Software Engineering is considered by many to be an engineering discipline because there are pragmatic approaches and expected characteristics of engineers. Proper analysis, documentation, and commented code are signs of an engineer.

Programs are built in as a sequence of steps. By properly defining and carrying out those steps, much like a manufacturing assembly line, a software engineer advocates hope to improve the productivity and the quality of final programs. This approach inspires many different processes and methodologies.

Commercial (and many non-commercial) software projects require management. There are budgets and schedules to set, people to hire and lead, resources (office space, computers) to acquire. All of this fits more appropriately within the purview of management. Art Programs contain many artistic elements, akin to writing or painting. User interfaces should be aesthetically pleasing to users. Code should be aesthetically pleasing to programmers.

The act of writing software requires that developers summon the energy to find the answers they need while they are at the keyboard. Some argue that Software Engineers need inspiration to spark the creation of code. Sometimes a creative spark is really needed to create the architecture or develop a piece of code..

Is SE (or should SE be) a branch of programming, a branch of computer science, a branch of traditional engineering, or a field that stands on its own? There is considerable debate over this.

Programming emphasizes writing code, independent of projects and customers. Software engineering emphasizes writing code in the context of projects and customers by making plans and delivering applications.

Many believe that software engineering is a part of computer science, because of their close historical connections and their relationship to mathematics. They advocate keeping Software Engineering as a part of computer science. Both computer science and software engineering care about programs. Computer science emphasizes the theoretical, eternal truths while software engineering emphasizes practical, everyday usefulness.

Others advocate making Software engineering a part of traditional engineering. Both engineering and software engineering share many project management problems and solutions. But, they apply different technologies; they use different kinds of processes, and are driven by different economics. Recently software engineering has been finding its own identity and emerging as an important freestanding field. Practitioners are slowly realizing that they form a huge community. Software engineering may need to create a form of regulation/licensing appropriate to its own circumstances. It is arguable that licensing is inappropriate because the creation of software represents a form of writing, and requiring people to be licensed in order to write computer programs may be a violation of the First Amendment. Requiring software engineers to be licensed would make persons who create software without a license into criminals.

Future directions for software engineering Aspect-oriented programming and agile methods are important emerging SE technologies and practices. Aspects help programmers deal with utilities by providing tools to add or remove boilerplate code from many areas in the source code. Aspects describe how all objects or functions should behave in particular circumstances. For example, aspects can add debugging, logging, or locking control into all objects of particular types. Researchers are currently working to understand how to use aspects to design general-purpose code. The Future of Software Engineering is defined as the state of the art which lists many problems to be solved over the next decade by seeking innovative ideas.

Ex.1. Read Text 2 and choose the right answer to the questions.
1. How is the use of mathematics called within software engineering?
a) formal methods b) algorithms c) application
2. What can be measured under various workloads?
a) performance and scalability of programs b) scientific properties c) effectiveness of caches
3. What issues are considered to be scientific within software engineering?
a) codification of data, sequence of steps b) application of programs, c) bigger processors, faster
networks, newer databases
4. Why is software engineering considered by many as engineering discipline?
a) because of the revolutionary new methods of work
b) because of pragmatic approaches and expected characteristics of engineers
c) because of the correctness and complexity of many algorithms
5. What elements do art programs contain?
a) many project management problems
b) many artistic elements, akin to writing or painting
c) many different processes and methodologies
6. What does the art of writing software require?
a) summoning the energy to find the answers the developers need
b) developing a piece of code
c) strategic management
7. What does software engineering emphasizes unlike programming?
a) writing code, independent of projects and customers
b) writing code in the context of projects
c) writing different algorithms
8. Why do many people believe software engineering is a branch of computer science?
a) because of the implications for professionalism, licensing, and ethics
b) because of their relationship to mathematics
c) because of their care about programs
9. What do both engineering and software engineering apply?

a) different technologies and different kinds of processes
b) different programs
c) different training appliances
10. How is the future of Software Engineering defined?
a) usage of computer programs all over the World
b) total atomization of production processes
c) state of the art which lists many problems to be solved over the next decade

Ex.2. Match the English and Russian equivalents.

1. concepts rigorously proven	a. в пределах сферы управления
2. performance, scalability of programs	b. основная отличительная черта
3. mathematical equation	c. математическое уравнение
4. within the purview of management	d. точно доказанные концепции
5. the key attribute	e. масштабируемость программ
6. a branch of programming	f. иметь дело с сервисными программами
7. important implications	g. упорно возражать
8. a polarizing issue	h. отрасль программирования
9. staunchly oppose	i. важный вопрос
10. aspect-oriented programming	j. превосходить другие элементы
11. deal with utilities	k. отладка
12. debugging	l. аспектно-ориентированное программирование

Ex.3. Translate the following word phrases from Russian into English.
Математические свойства; корректность алгоритмов; теория вычисляемости; расширяемость программы; производственная сборочная линия;; сфера применения управления; пользовательский интерфейс; дискуссия, непреклонно возражать; придавать особое значение вечным истинам; практическая повседневная пригодность; применять различные технологии; прикладная модель лицензирования; автономная область;; оптимизирующие компиляторы; промышленная универсальная ЭВМ; портативный компьютер.

Ex.4. Complete the sentences.
1. The correctness and complexity of many algorithms are mathematical concepts that can be …
2. There are budgets and schedules…, people to…, resources (office space, computers) to…
3. Programming emphasizes writing code, independent of …

4. Many believe that software engineering is a part of computer science, because of their …

5. Both … and…share many project management problems and solutions

6. Recently, software engineering has been finding its own identity and emerging as an …

7. It seems likely that …will continue evolving for many decades to come

8. The Future of Software Engineering is defined as …which lists many problems to be solved over the next decade by …

Ex.5. Are these statements false or true? Correct the false ones.

1. Programs are finite, so in principle, developers could know quite a few things about a program in a rigorous mathematical way.

2. The use of mathematics within software engineering is often called informal methods.

3. The performance and scalability of programs under various workloads cannot be measured.

4. Software Engineering is considered by many to be an engineering discipline because there are pragmatic approaches and expected characteristics of engineers.

5. There are budgets and schedules to set, people to hire and lead, resources (office space, computers) to acquire.

6. Software engineering emphasizes writing code in the context of projects and customers by making complicated mathematical equations.

7. Many believe that software engineering is a part of computer science, because of their close historical connections and their relationship to mathematics.

8. Computer science emphasizes the theoretical, eternal truths while software engineering emphasizes practical, everyday usefulness.

9. Neither engineering and nor software engineering share many project management problems and solutions

10. It seems likely that software engineering will not continue evolving for many decades to come.

Ex.6. Choose the right answer and complete the dialogue. Learn it by heart.

Student: Could you help me?

Librarian: ……………….. .

a) - Wait a little. Can you come later?

b) - I`d be glad to. What is it?

c) - Oh! I haven`t seen you for ages! Would you remind me of your last visit here?

d) - What?!

Student: I am interested in Software Engineering. Could you recommend me any literature to improve my knowledge?

Librarian: …………………

a) – Sorry! We doesn`t seem to have any of those books just now. Come later.

b) – Really?! How clever of you!

c) – I told you a dozen times I didn`t get the slightest idea!

d) – Certainly! We are sure to have a large variety of books on Computer Engineering and related occupations. Here they are!

Student: …………………

a) – It`s a pity you don`t have any!

b) – Oh! I see. All of them are up-to-date and of great importance to me. Thanks a lot!

c) – Never mind! It`s all the same to me.

d) – Bye! I`ll drop in the other day.

Ex.7. Match the English and Russian equivalents.

Resume   рекламное письмо

Cover Letter   письмо-запрос

Inquiry Letter   краткая биография

Advertizing Letter   сопроводительное письмо

Read the extract below. Define the type of a business document.

……………………………………………………………………………………………………

…With reference to your advertisement in yesterday`s "New-York Times", could you please send me a copy of your latest catalogue of software engineering tools. I would also like to know if it is possible to make purchases on-line…

....

a) Resume b) Cover Letter c) Inquiry Letter d) Advertising Letter

Ex.8. Summarize the context of text "The nature of Software engineering" using key phrases.

1. The title of this text is …

2. The object of this text is to present …

3. The text discusses some problems relating to … (deals with some aspects of …)

4. The paper begins with a definition of … (at first the author describes …)

5. The next paragraph deals with …

6. After discussing … the author turns to …

7. Next it should be noticed that …

8. The final paragraph states … (describes, ends with …)

9. The conclusion is that …

10. In my opinion the paper is interesting (not interesting), of (no, little, much) importance, valuable, useful (useless)…

UNIT 2. COMPUTER SOFTWARE ENGINEERING TRAITS

Vocabulary

advancement opportunities - возможности продвижения

applicant – претендент, соискатель

carpal tunnel syndrome – кистевой туннельный синдром

complicate – затруднять, осложнять

continually strive to acquire – непрерывно стараться приобретать

core – основной, сердцевина

customize – настраивать, модифицировать

entry-level - начальный уровень

establishment – учреждение, организация

evaluation – оценка

eventually – со временем, в конце концов

evolve – развертывать, выводить

expertise – знания, компетентность

frequent – частый, повторяющийся

hand-held – портативный, переносной

help keep up with - помочь не отстать от

implement – выполнять, осуществлять

in conjunction with – вместе с…

incentive – побуждение, стимул

insurance providers – страховые компании

internship – интернатура

involve – вовлекать

lucrative – выгодный

managerial – административный

manifold – многочисленный, разнообразный

meet deadline – уложиться в срок

off-shore – действовать в другой стране

outsourcing – привлечение внешних ресурсов

relevant – существенный, важный

proliferation – распространение, разрастание

prone – склонный, предрасположенный

self-employed – работающий не по найму, обслуживающий свое собственное предприятие

safeguarding – обеспечение безопасности

simultaneously – одновременно

sophisticated – современный, передовой

spur – побуждать, подстегивать

susceptible to eyestrain – подвержены зрительному напряжению

telecommuting - дистанционное присутствие

temper – умерять, смягчать

utility – полезность, выгодность

vendor - продавец, торговец

Pretext exercises

Ex.1. Mind the rules of pronunciation.
[f]: phone, philosophy, alphabet, atmosphere, phase, phantom, photograph, sphere;

[kw]: question, square, quote, quality, qualify, quest, quite, inquire, quarter, quick;

[a:]: mark, parking, farm, architect, arc, arsenal, bark, marshal, example, plant, dance, craftsmanship;

[o]: software, box, focus, responsible, operate, common, shop, dot, accommodate.

Ex.2. Form nouns or adjectives using suffixes and translate them.

er: to begin, to start, to fight, to drive, to lead, to finance, to export, to import, to work, to operate;

ment: to pay, to employ, to develop, to improve, to judge, to move, to punish, accomplish;

ion: to anticipate, to succeed, to accommodate, to appreciate, to allocate, to compute;

ism: capital, critic, liberal, race, hero, artist, national, opportune;

able: honor, to comfort, to accept, to drink, to believe, to achieve, to adapt, to pass, advice, to think;

ous: danger, courage, outrage, to continue, hazard, fame, fury.

Ex.3. Insert the proper word.

1. When Anna got paid she bought … new clothes.

a) she b) her c) hers d) herself

2. I am afraid the problem is … … , than it seems.

a) much more complicated b) more less complicating c) much complicated d) the most complicated

3. The rent is 50 dollars … week.

a) - b) a c) an d) the

4. If you run … two hares, you will catch neither.

a) behind b) for c) from d) after

5. He was … tired … thirsty for it was very hot.

a) either…or b) both…and c) neither… nor d) not so… as

Ex.4. Choose the right variant and complete the dialogue.

Clerk: - … … ….

a) - What`s the problem?

b) - Have a nice trip!

c) - What do you want?

d) - May I help you?

Customer: - I`d like to book two round up tickets to Boston. Can I do it?

Clerk: - … … … .

a) – It`s none of my business!

b) – You had better come tomorrow if you want to get your tickets.

c) – Tickets to Boston! Why not take a taxi?

d) – Sure! Just tell me time and date, if you please.

Customer: - 5 p.m. next Tuesday. How long will it take me to get my tickets?

Clerk: - … … …
a) – I don`t know. Drop in the other day!
b) – Oh! You don`t have to wait long.
c) – Don`t worry! It won`t take you much time. You can get them in 3 days.
d) – You`re such a curious person!
Customer:" Thank you very much."

Text 1

Software Engineer Job

Computer software engineers apply the principles of computer science and mathematical analysis to the design, development, testing, and evaluation of the software and systems that make computers work. The tasks performed by these workers evolve quickly, reflecting new areas of specialization or changes in technology, as well as the preferences and practices of employers. Software engineers can be involved in the design and development of many types of software, including computer games, word processing and business applications, operating systems and network distribution, and compilers, which convert programs to machine language for execution on a computer.

Software engineers begin by analyzing users' needs, and then design, test, and develop software to meet those needs. They create the detailed sets of instructions, called algorithms that tell the computer what to do. They also may be responsible for converting these instructions into a computer language, a process called programming or coding, but this usually is the responsibility of computer programmers. Computer software engineers must be experts in operating systems and middleware to ensure that the underlying systems will work properly. Software engineers analyze users' needs and design, construct, and maintain general computer applications software or specialized utility programs. These workers use different programming languages, depending on the purpose of the program. The programming languages most often used are C, C++, and Java. Some software engineers develop both packaged systems and systems software or create customized applications.

Computer systems software engineers coordinate the construction, maintenance, and expansion of an organization's computer systems. Working with the organization, they coordinate each department's computer needs - ordering, inventory, billing, and payroll recordkeeping, for example - and make suggestions about its technical direction. They also might set up the organization's intranets - networks that link computers within the organization and ease communication among various departments.

Systems software engineers also work for companies that configure, implement, and install the computer systems of other organizations. These workers may be members of the marketing or sales staff, serving as the primary technical resource for sales workers. They help with sales and provide customers with technical support. Since

the selling of complex computer systems often requires substantial customization to meet the needs of the purchaser, software engineers help to identify and explain needed changes. Systems software engineers are responsible for ensuring security across the systems they are configuring. Computer software engineers often work as part of a team that designs new hardware, software, and systems. A core team may comprise engineering, marketing, manufacturing, and design people, who work together to release a product.

Ex.1. Read the text and answer the following questions.
1. What principals do computer software engineers apply to the design, development, testing, and evaluation of the software and systems that make computers work?
2. Where can software engineers be involved to?
3. What may computer software engineers be responsible for?
4. What are the most often used programming languages?
5. What do computer software engineers coordinate working with the organization?
6. What are the functions of any organization`s intranet?
7. Are systems software engineers responsible for ensuring security across the systems they configure?

Ex.2. Give the Russian Equivalents.
Development, testing and evaluation of the software and system; word processing, business applications; operating systems and net work distribution; maintain general computer applications software or specialized utility programs; the programming languages most often used; ordering, inventory, billing and payroll recordkeeping; to set up the organization`s intranet; configure, computer systems; to require substantial customization; to be responsible for ensuring security across the systems; to provide customers with technical support.

Ex.3. Give the English equivalents.
Применять принципы; математический анализ; предпочтения и виды деятельности; включать компьютерные игры; обработка информации; коммерческие прикладные программы; преобразование команд в компьютерный язык; устанавливать компьютерные системы; облегчать связь между различными подразделениями; предоставлять клиентам техническую поддержку; служить основным техническим ресурсом; гарантировать безопасность системы.

Ex.4. Look through the text, complete the sentences.
1. Computer software engineers apply the principles of computer science and…

2. …can be involved in the design and development of many types of software, including computer games…
3. Computer software engineers create the detailed sets of instructions called… that tell the computer what to do.
4. …also might set up the organization`s intranets…
5. Computer software engineers often work as a part of a team…

Ex.5. Are these statements false or true? Correct the False Ones.
1. The tasks performed by these workers evolve quickly, reflecting new areas of specialization or changes in technology, as well as the preferences and practices of employers.
2. Computer software engineers stop analyzing users' needs, and then design, test, and develop software to meet those needs.
3. They are never responsible for converting these instructions into a computer language, a process called programming or coding, but this usually is the responsibility of computer programmers.
4. Computer applications software engineers analyze users' needs and design, construct, and maintain general computer applications software or specialized utility programs.
5. Computer software engineers must be experts in operating systems and middleware to ensure that the underlying systems will work properly.
6. Working with the organization, they don`t coordinate each department's computer needs - ordering, inventory, billing, and payroll recordkeeping, for example - and never make suggestions about its technical direction.
7. Systems software engineers also work for companies that configure, implement, and install the computer systems of other organizations.
8. Since the selling of complex computer systems never requires substantial customization to meet the needs of the purchaser, software engineers don`t help to identify and explain needed changes.
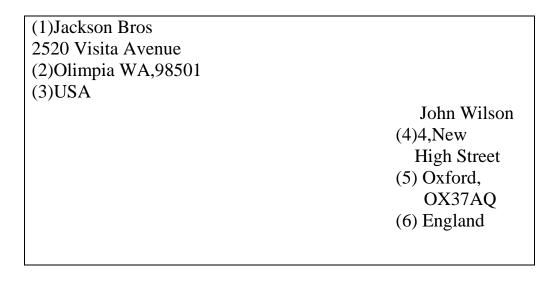9. Computer software engineers often work separately not as a team that designs new hardware, software, and systems.

Ex.6. Look through Text 1. Choose the right variant defining the nature of work of a software engineer.
These workers … … …
a) …evolve quickly, reflecting new areas of specialization or changes in technology.
b) …apply the principles of computer science and mathematical analysis to the design, development, testing, and evaluation of the software and systems.
c) …begin by analyzing users' needs, and then design, test, and develop software to meet those needs.
d) …use different programming languages, depending on the purpose of the program.

e) …also might set up the organization's intranets.

Ex.7. Here is an envelope. Enumerate the answers.

(1)Jackson Bros
2520 Visita Avenue
(2)Olimpia WA,98501
(3)USA

John Wilson
(4)4,New
High Street
(5) Oxford,
OX37AQ
(6) England

[ ] – the sender
[ ] – the country in the mailing address
[ ] – the town the letter comes from
[ ] – the addressee`s house number
[ ] – the town in the mailing address
[ ] – the country the letter comes from
Make an envelope of your own.

Ex.8. Complete the dialogue and act it out.
Teacher - The curriculum of higher technical schools include some specialized subjects, computer software engineering is the most important one. It helps future software engineers develop necessary practical skills. What principals do computer software engineers apply?
Student - … … …
Teacher – Precisely! And what main tasks do software engineers usually perform?
Student – They design and develop many types of software, including …
Teacher – You are well-informed on the nature of work of a software engineer. And what is the term for converting algorithms into a computer language?
Student – The process of converting algorithms into a computer language is called …
Teacher – What programming languages are mostly used nowadays?
Student - … … …
Teacher – The functions of a software engineer dealing with large computer systems seem to be much more manifold. What do computer systems software engineers coordinate?

Student – They usually coordinate … … … and they also might set up … … …
Teacher – You are quite right! So what are systems software engineers responsible for?
Student - … … …
Teacher – So what conclusion can you make?
Student - Computer software engineers often work as part of a team that … … …

Ex.9. Translate this extract into English using the words and phrases below.

assistance - содействие
Bernoulli number – число Бернулли
block – узел
cogwheel – зубчатое колесо
compile – составлять (программу)
complex – сложный
computation, computing - вычисление
control – управлять
equation - уравнение
gadget - устройство
hardware – устройство
input – ввод
linear - линейный

make – делать, производить, осуществлять
number order – разряд числа
output - вывод
specified – определенный
steam drive – паровой привод
storage – запоминание, хранилище
succession - последовательность
suppose – предполагать, полагать
table of squares – таблица квадратов
unit – блок, устройство

Создание первых компьютеров: «Аналитическая» машина Бэббиджа.

В 1812 году английский математик и экономист Чарльз Бэббидж (Charles Babbage) начал работу над созданием машины, которая должна была проводить вычисления по программе, задающей определённую функцию. В качестве основного элемента своей машины Бэббидж взял зубчатое колесо для запоминания одного разряда числа. К 1822 году учёный построил небольшую действующую модель и рассчитал на ней таблицу квадратов.

В 1834 году Бэббидж приступил к созданию «аналитической» машины. Его проект содержал более 2000 чертежей различных узлов. Машина Бэббиджа предполагалась как чисто механическое устройство с паровым приводом. Она состояла из хранилища для чисел, блока для производства арифметических действий, устройства, управляющего операциями машины в нужной последовательности, а так же устройств для ввода и вывода. Бэббидж работал над созданием своей машины до конца своей жизни (он умер в 1871 году), успев сделать лишь некоторые узлы своей машины, которая оказалась слишком сложной для того уровня развития техники.

Text 2

Computer Software Engineering Traits

Work environment Computer software engineers normally work in clean, comfortable offices or in laboratories in which computer equipment is located. Software engineers who work for software vendors and consulting firms frequently travel overnight to meet with customers. Telecommuting is also becoming more common, allowing workers to do their jobs from remote locations. Most software engineers work at least 40 hours a week, but about 17 percent work more than 50 hours a week. Software engineers also may have to work evenings or weekends to meet deadlines or solve unexpected technical problems. Like other workers who spend long hours typing at a computer, software engineers are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome. Most employers prefer applicants who have at least a bachelor's degree and experience with a variety of computer systems and technologies. In order to remain competitive, computer software engineers must continually strive to acquire the latest technical skills. Advancement opportunities are good for those with relevant experience.

Education and training Most employers prefer applicants who have at least a bachelor's degree and broad knowledge of, and experience with, a variety of computer systems and technologies. The usual college major for applications software engineers is computer science or software engineering. Systems software engineers often study computer science or computer information systems. Graduate degrees are preferred for some of the more complex jobs. In 2006, about 80 percent of workers had a bachelor's degree or higher. Academic programs in software engineering may offer the program as a degree option or in conjunction with computer science degrees. Because of increasing emphasis on computer security, software engineers with advanced degrees in areas such as mathematics and systems design will be sought after by software developers, government agencies, and consulting firms. Students seeking software engineering jobs enhance their employment opportunities by participating in internships. These experiences provide students with broad knowledge and experience, making them more attractive to employers. Inexperienced college graduates may be hired by large computer and consulting firms that train new employees in intensive, company-based programs.

Certification and other qualifications Systems software vendors offer certification and training programs, but sometimes program certification alone is not sufficient for the majority of software engineering jobs. People interested in jobs as computer software engineers must have strong problem-solving and analytical skills. They also must be able to communicate effectively with team members, other staff, and the customers they meet. Because they often deal with a number of tasks simultaneously, they must be able to concentrate and pay close attention to detail. As technology advances, employers will need workers with the latest skills. Software engineers must continually strive to acquire new skills if they wish to remain in this dynamic field. To help keep up with changing technology, workers may take continuing education and professional development seminars offered by employers, software vendors,

colleges and universities, private training institutions, and professional computing societies. Computer software engineers also need skills related to the industry in which they work. Engineers working for a bank, for example, should have some expertise in finance so that they understand banks' computer needs.

Ex.1. Read and find out the answers in the text.
1. Where do computer software engineers normally work?
2. What does telecommuting allow workers?
3. How long do computer software engineers have to work to meet deadlines or solve unexpected technical problems?
4. What diseases are computer software engineers susceptible to like other workers who spend long hours typing at a computer?
5. What applicants do most employers prefer?
6. Why will computer software engineers with advanced degrees in areas such as mathematics and systems design be sought after by software developers?
7. Is program certification alone sufficient for the majority of software engineering jobs?
8. What skills must software engineers have?
9. What must computer software engineers continually strive to acquire if they wish to remain in this dynamic field?
10. What may help to keep up with changing technology?

Ex.2. Match the English and Russian equivalents.

1. software vendors	a. восприимчивый к глазному напряжению
2. telecommuting	b. частные учебные заведения
3. meet deadlines	c. в согласии с информатикой
4. solve unexpected technical problems	d. увеличивать рабочие возможности
5. susceptible to eyestrain	e. продавцы программного обеспечения
6. variety of computer systems	f решать непредвиденные технические проблемы
7. in order to remain competitive	g. соответствовать срокам выполнения
8. in conjunction with computer science	h. режим дистанционной работы
9. enhance the employment opportunities	i. разнообразие компьютерных систем

Ex.3. Translate this text into English and title It. Use the active vocabulary.

Разработчики программного обеспечения работают в чистых, удобных кабинетах или лабораториях, где обычно находятся компьютеры. В наши дни им приходится часто работать не только днем, но и по вечерам, и в выходные для того, чтобы уложиться в срок. Поэтому дистанционное присутствие на рабочем месте становится все более распространенным. Это позволяет более эффективно решать непредвиденные технические проблемы, для которых требуется значительный опыт работы с различными компьютерными системами. Деятельность разработчиков программного обеспечения делает их чувствительными к зрительному напряжению, недомоганию в спине, проблемам в руке и запястье, таким как кистевой туннельный синдром. Теперь, когда повышается внимание к компьютерной безопасности, обширные знания и опыт этих специалистов в информатике позволяют увеличивать рабочие возможности компьютеров и делают их привлекательнее для нанимателей.

Ex.4. Complete the sentences according to the text.
1. Computer software engineers normally work in clean, comfortable offices or in laboratories in which …
2. …is also becoming more common, allowing workers to do their jobs from remote locations.
3. …also may have to work evenings or weekends to …or solve unexpected technical problems.
4. …software engineers are susceptible to eyestrain, back discomfort, and hand and wrist problems such as...
5. Most employers prefer applicants who have at least a bachelor's degree and experience with...
6. …on computer security, software engineers with advanced degrees in areas such …will be sought after by software developers, government agencies, and consulting firms.
7. These experiences provide students with…, making them more attractive to employers.
8. Systems software vendors offer certification and training programs, but most training authorities say that program certification alone is not …
9. People interested in jobs as …must have strong problem-solving and analytical skills.

Ex.5. Read the statements and say whether they are false or true.
1. Software engineers who work for software vendors and consulting firms seldom travel overnight to meet with customers.
2. Most software engineers work at least 40 hours a week, but about 17 percent work more than 50 hours a week.

3. Like other workers who spend long hours typing at a computer, software engineers are never susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

4. In order to remain competitive, computer software engineers needn`t continually strive to acquire the latest technical skills.

5. Advancement opportunities are good for the workers with no experience.

6. Most employers prefer applicants who have at least a bachelor's degree and broad knowledge of, and experience with, a variety of computer systems and technologies.

7. Because of increasing emphasis on computer security, software engineers with advanced degrees in areas such as mathematics and systems design will be sought after by software developers, government agencies, and consulting firms.

8. Inexperienced college graduates are never hired by large computer and consulting firms that train new employees in intensive, company-based programs.

9. Computer software engineers must be able to communicate effectively with team members, other staff, and the customers they meet.

10. To help keep up with changing technology workers take education and professional seminars offered by software employers, only once or twice a year.

Ex.6. Choose the right word.

1. Computer software engineers normally work in clean, comfortable offices or in laboratories in which computer equipment is… .
a) situated b) located c) presented

2. Telecommuting is also becoming more … , allowing workers to do their jobs from remote locations.
a) common b) usual c) frequent

3. Advancement opportunities are good for those with relevant … .
a) skill b) experience c) experiment

4. Employment opportunities by … in internships provide students with broad knowledge and experience.
a) participating b) involving c) evolving

5. Computer software engineers must be able to … effectively with other staff.
a) communicate b) talk c) chat

Ex.7. Read this extract. Choose the variant determining its main idea.
a) Computer software engineers normally work in clean, comfortable offices.
b) Computer software engineers have to work evenings or weekends to meet deadlines.
c) Computer software engineers are the most asked-for professionals nowadays.
d) Computer software engineers experience with a variety of computer systems and technologies.

Work environment

Software engineers who work for software vendors and consulting firms frequently travel overnight to meet with customers. Telecommuting is also becoming more common, allowing workers to do their jobs from remote locations. Most software engineers work at least 40 hours a week, but about 17 percent work more than 50 hours a week. Software engineers also may have to work evenings or weekends to meet deadlines or solve unexpected technical problems. Like other workers who spend long hours typing at a computer, software engineers are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome. Most employers prefer applicants who have at least a bachelor's degree and experience with a variety of computer systems and technologies. In order to remain competitive software engineers must acquire the latest technical skills.

Ex.8. Complete the dialogue and learn it by heart.
Interviewer: - I`m glad to meet you. Can I ask you any questions?
Software engineer: - So am I. Do please!
Interviewer: - Software engineering is getting more and more ubiquitous nowadays, as computers become part of our lives. And more and more young people are getting interested in a profession of software engineer.
Software engineer: - That's so, really!
Interviewer: - Can you tell us about the work environment computer software engineers normally work in?
Software engineer: - Yes, I can. Computer software engineers normally work in … …
Interviewer: - Telecommuting is also becoming more common now. What does it allow to do?
Software engineer: - It allows … … …
Interviewer: - How many hours a week do software engineers usually work?
Software engineer: - … … …
Interviewer: - What diseases are software engineers susceptible to like any other workers who spend long hours typing at a computer?
Software engineer: - These are …, …, … That`s pretty serious!
Interviewer: - Is it so important for a software engineer to be well-educated and experienced in the chosen field?
Software engineer: - It is! Most employers prefer applicants who … … …
Interviewer: - That`s really so! Thank you very much for the conversation.

Ex.9. Arrange the items of a business letter in a right order.
[ ] – Thank you for your inquiry about our telephone answering machines and voice mail systems. I`m enclosing brochures on our products. A sales representative will be in London next week. We will call you to schedule an appointment.
[ ] – Charles Lyons
      General Television Services

1201 East Grand Avenue
        Chicago, Illinois 60611
[ ] – John Bonds
        Marketing manager
[ ] – Dear Mr. Lyons,
[ ] – The British Engineering Co,
        12 New City Road
        London, E.C.I

Write a business letter of your own.

Ex.10. Make up a summary of the text. Use pivot phrases.
This article is titled …;
The article is concerned with …(is devoted to …);
The article begins with a short discussion of…;
The author points out …;
Then the extract goes on to the problem (issue) of …;
The next paragraph deals with …;
After discussing … the author turns to …;
Further the author tries to … (explains that …);
It is evident that …;
To summarize the author admits (points out) that …;
The conclusion is that …;
In my opinion the paper is interesting (of importance, valuable, useful) ….

UNIT 3   SOFTWARE SYSTEMS

Vocabulary

assembly code – компонующий автокод

assigned – заданный, назначенный

conceptual – абстрактный, отвлеченный

constraint – ограничение, принуждение

debugger – отладчик

declarative – повествовательный, официальный

enhancement – улучшение

executable – выполнимый, осуществимый

interpretable – интерпретируемый

memo – служебная записка

notation – система обозначений

ordering – упорядоченье

overview – общее представление

plumb – водопроводно-канализационная система

proliferate – распространяться, разрастаться

specification – детализация, технические условия

template – образец

walkthrough – сквозной контроль, анализ программы

Pretext exercises

Ex.1. Mind the rules of pronunciation.

[o:]: order, force, corporate, report, board, formula, all, form, subordinate, ignore;

[a:]: part, are, demand, sharp, alarm, dance, large, pardon, arm, artificial, car, shark;

[ə:]: further, purpose, person, refer, concern, certain, earth, word, nervous, servant;

[ɛə]: share, software, compare, repair, fair, hair, aware, tear, care, pair, prepare, dare;

[iə]: fear, dear, period, serious, sincere, engineer, clear, mere, severe, hero, zero;

[aiə]: fire, require, retire, diary, entire, hire, tired, aspire, desire, admire, wire.

Ex.2. Insert the right word.

1. It`s pretty hard to … against big established companies.

a) compute b) compete c) complete d) competition

2. The right to … has been described as basic human right.

a) education b) general knowledge c) graduate courses d) compulsory education

3. A person who owns a part of a company or corporation is called … .

a) stockholder b) patron c) stock market d) manager

Ex.3. Fill in the right proposition.

1. - Where is Jane? I`m tired … waiting

a) in b) - c) of d) after

2. She was sitting quietly and smiling … me.

a) on b) with d) in d) at

3. Suddenly she burst … tears.

a) out b) in c) into d) to

4. He was the only person to do business … .

a) on b) with c) -   d) at

Ex.4. Choose the right word-combination and fill in the blanks in the Memo.

To   : (1) ---------- Sales Dept.

(2) ----------: Dolly Dean, Production Manager

Date   : 31 March

Subject   : (3) -----------

I`m fed up with Bowers. He doesn`t care about his job. He doesn`t get along with the other people in the office. I can`t count on him to be on time – or even to work at all.

The point of all this is that the Personnel Department can start interviewing people, because there`s going to be a job opening in the Sales Department very soon.
(4) -----------

[ ] – Jack Bowers

[ ] – Anita Wheeler

[ ] – Dolly

[ ] - From

Text 1

Manufacturing Software Systems

A software system consists of executable computer code and the supporting documents needed to manufacture, use, and maintain the code. Software engineering is ever more important as larger, more complex, and life-critical software systems proliferate. The rapid decline in the costs of computer hardware means that the software in a typical system often costs more than the hardware it runs on. Large software systems may be the most complex things ever built. This places great demands on the software engineering process, which must be disciplined and controlled. To meet this challenge, software engineers have adapted many techniques from older engineering fields, as well as developing new ones.

The Phases of Software Engineering Processes The software engineering process itself is usually divided into phases. The definition of these phases, their ordering, and the interactions between the phases specify a software life-cycle model. The best-known life-cycle model is the waterfall model consisting of a requirements definition phase, a design phase, a coding phase, a testing phase, and a maintenance phase. The output of each phase serves as the input to the next. The purpose of the requirements phase is to define what a system should do and the constraints under which it must operate. This information is recorded in a requirements document. A typical requirements document might include a product overview; a specification of the development, operating, and maintenance environment for the product; a high-level conceptual model of the system; a specification of the user interface; specification of functional requirements; specification of nonfunctional requirements; specification of interfaces to systems outside the system under development; specification of how errors will be handled; and a listing of possible changes and enhancements to the system. Each requirement, usually numbered for reference, must be testable. In the design phase, a plan is developed for how the system will implement the requirements. The plan is expressed using a design method and notation. Many methods and notations for software design have been developed. Each method focuses on certain aspects of a system and ignores or minimizes others. This is similar to viewing a building with an architectural drawing, a plumbing diagram, an electrical wiring diagram, and so forth. The coding phase of the software life-cycle is concerned with the development of code that will implement the design. This code is written in a formal language called a programming language. Programming languages have evolved over time from sequences of ones and zeros directly

interpretable by a computer, through symbolic machine code, assembly languages, and finally to higher-level languages that are more understandable to humans. Most coding today is done in one of the higher-level languages. When code is written in a higher-level language, it is translated into assembly code, and eventually machine code, by a compiler. Many higher-level languages have been developed, and they can be categorized as functional languages, declarative languages, and imperative languages. A programmer typically writes the code using a text editor. Sometimes a syntax-directed editor that "knows" about a given programming language and can provide programming templates and check code for syntax errors is used. Various other tools may be used by a programmer, including a debugger that helps find errors in the code, a profiler that shows which parts of a module spend most time executing, and optimizers that make the code run faster.

Ex.1. Read the text and answer the questions.
1. What does a software system consist of?
2. When is software engineering ever more important?
3. What does the rapid decline in the costs of computer hardware mean?
4. What have software engineers done to meet great demands on the software engineering process?
5. What are the phases of Software Engineering processes?
6. What is the best-known life-cycle model?
7. What is the purpose of the requirements phase?
8. What is the coding phase concerned with?
9. How is most coding done today?
10. What other tools may be used by a programmer?

Ex.2. Make up word-combinations and translate them.

1. to consist of …	the requirements
2. to meet these	conquer
3. to divide and	complex problems
4. to handle …	walkthroughs and inspections
5. to maintain …	challenges
6. to implement …	executable computer code
7. to use …	the environment

Ex.3. Complete the sentences.
1. …of computer hardware means that the software in a typical system often costs more than the hardware it runs on.
2. To meet this challenge, … many techniques from older engineering fields, as well as developing new ones.
3. The purpose of the requirements phase is to define what …

4. This code is written in a formal language called a…

5. When code is written in a higher-level language, it is translated into assembly code, and eventually machine code …

6. Many higher-level languages can be categorized as …

7. Various other tools may be used by a programmer, including a …that helps find errors in the code, a … that shows which parts of a module spend most time executing, and …that make the code run faster.

Ex.4. Give English equivalents from the above-stated text.

Система программного обеспечения; компьютерный код; снижение цен на комплектующие; ответить на вызов; определение требований; общее представление о продукте; условия окружающей технической среды; абстрактная модель системы; текстовый редактор; программные модели (матрицы); отладчик; процесс проверки программного обеспечения; взаимодействие компонентов системы; приемочные испытания; совокупность тестовых данных; регрессивное тестирование; этап технического обслуживания; адаптивное сопровождение; управление конфигурацией.

Ex.5. Make up a dialogue. Ask your group-mate.

1. – whether software engineering is getting more important as large and complex software systems proliferate.

2. – if software engineers adapt many techniques from older engineering fields, as well as developing new ones.

3. – whether the purpose of the requirements phase is to define what a system should do and the constraints under which it must operate.

4. – what he knows of the design phase, whether it is a plan developed for how the system would implement the requirements or not.

5. – what the most important activity is since software systems change frequently over time.

6. – if programming languages have evolved over time.

Ex.6. Read the extract below and choose the statement that corresponds to it.

The Software Testing Process is ...

a) necessary only for documents in support of the software such as user manuals;

b) aimed at examining a software product to find errors and usually divided into several phases;

c) always done on the entire computer system;

The Software Testing Process is the process of examining a software product to find errors. This is necessary for all life-cycle products and all documents in support of the software such as user manuals. The software testing process is often divided into phases. The first phase is unit testing of software developed by a single programmer. The second phase is integration testing where units are combined and tested as a

group. System testing is done on the entire system, usually with test cases developed from the system requirements. The test case is the basic unit of testing. When software is changed to fix a bug or add an enhancement, a serious error is often introduced. To ensure that this does not happen, all test cases must be rerun after each change. The process of rerunning test cases to ensure that no error has been introduced is called regression testing.

Ex.7. Read the given extract and choose the right answer to the question.

What does configuration management activities include?

a) …requirements, design, implementation.
b) … version control, change control, build control.
c) … fixing errors, adding functionality, adapting a system.
d) … adaptation, correction, enhancement.

Maintenance consists of three activities: adaptation, correction, and enhancement. Enhancement is the process of adding new functionality to a system which demands requirements, design, implementation, and test. Studies have shown that about half of maintenance effort is spent on enhancements. Adaptive maintenance is the process of changing a system to adapt it to a new operating environment, for example, from Windows to the Linux operating system. Adaptive maintenance accounts for about a quarter of total maintenance effort. Corrective maintenance is the process of fixing errors in a system after release. Since software systems change frequently over time, an important activity is software configuration management. Configuration management activities include version control, which tracks versions of life-cycle objects; change control, that handles change requests to a system; and build control.

Ex.8. Study text Manufacturing Software Systems. Speak on the following
- What a software system consists of;
- The phases the Waterfall model is made up of;
- How programming languages have evolved over time.