
ИНОСТРАННЫЙ ЯЗЫК В ВУЗЕ

Владимирский государственный университет

Т.А. Назарова

AUTOMATION and FMS

Учебное пособие по английскому языку

Владимир 2005

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Учебное пособие включает в себя пять разделов, тему «Моя специальность», четыре лабораторные работы и задание для внеаудиторного чтения, выполнение которых позволит овладеть навыками чтения научно-технической литературы по специальности. Материалы учебного пособия основаны на оригинальных англо-американских текстах. Задания к ним содержат простые примеры разговорных клише и поэтапные задания, обучающие аннотированию и реферированию.

Предназначено для студентов высших учебных заведений специальностей «Автоматизация технологических процессов и производств» (220301) очной и заочной форм обучения, а также соискателей и аспирантов при изучении английского языка.

Табл. Ил.

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UNIT I. ROBOT-ASSISTED TECHNOLOGICAL COMPLEXES

I. Прочтите интернациональные слова. Дайте русские эквиваленты, не пользуясь словарем.

a) слова с полным совпадением по форме в двух языках:

robot, complex, computer, process, figure, transporter, minicomputer, stop, sort, signal.

б) слова с частичными различиями в графических образах:

production, technological, program, individually, central, line, automated, machine, type, defective, controller, operation, cycle, collect.

II. Прочтите следующие словосочетания, в которых существительное выступает в функции определения, и переведите их:

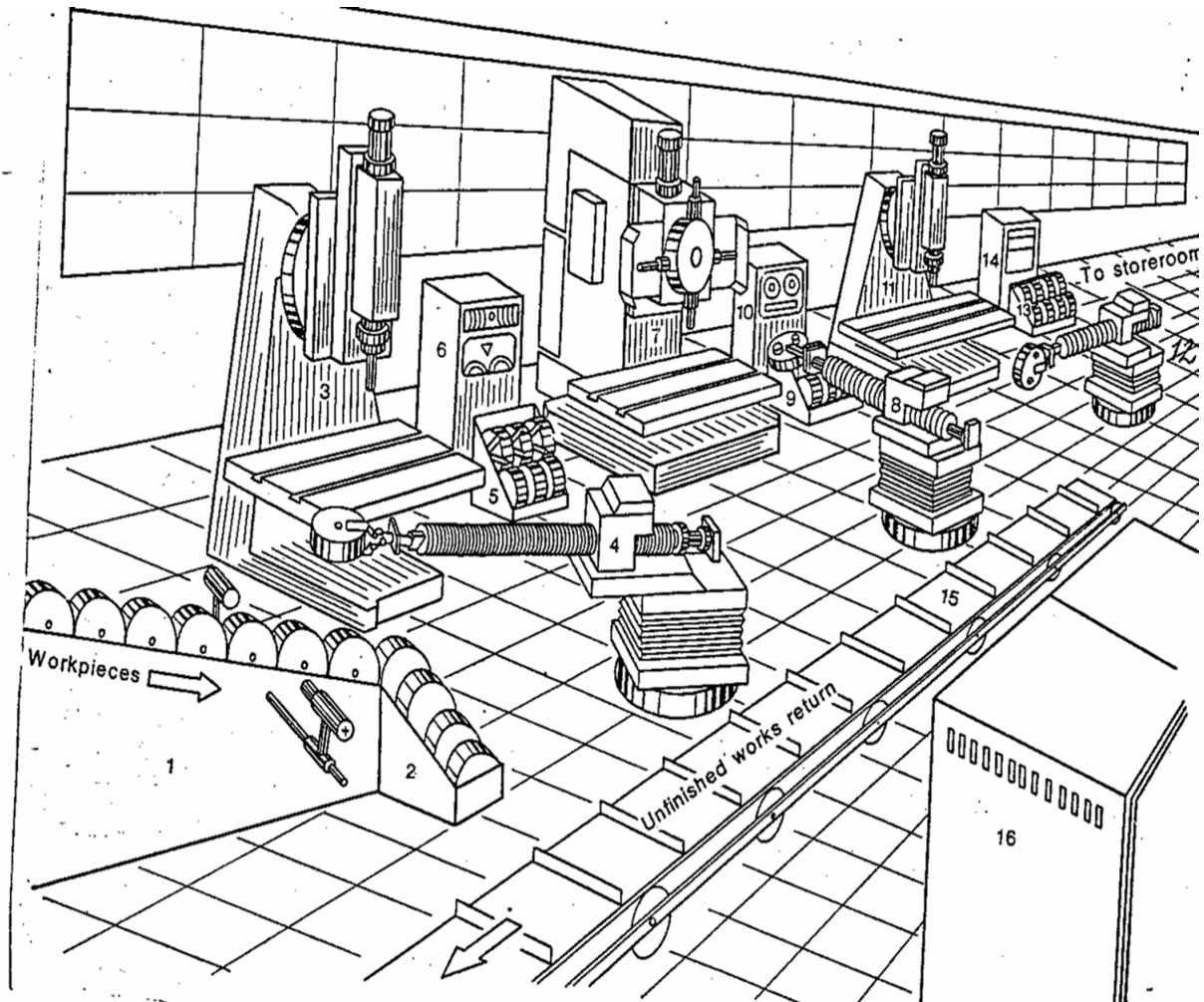
- a) feeder of the workpieces – workpieces feeder
transporter of the workpieces – workpieces transporter
speed of the robots – robot speed
rate of production – production rate
the operation of robots – robot operation
- b) complexes with robots – robot complexes
- c) equipment for production – production equipment
- d) store at the output – output store
- e) store in the form of a buffer – buffer store
- f) system of control of the robots – robot control system
the start of the machining cycle – cycle machining start
the parameter of speed of the robots – robot speed parameter

Text I

Robot-assisted technological complexes.

1. It is very important to connect robots with other production equipment so as to create the robot-assisted technological complexes. The robot in technological complexes may be programmed individually or by means of a central computer.
2. Individually controlled robots are used in complexes where technological processes are performed by means of single transfer lines. Fig. 1 shows robots in an automated metal-working transfer line having CNC machine tools.
3. The automated metal-working transfer line consists of three robots of similar types (4, 8, 12), two CNC milling and one CNC drilling machine tools (3,7, 11), a workpiece feeder (1) with a buffer store(2), additional stores for milled and drilled parts (5, 13, 9), output store (13), transporter for removal of defective and unfinished workpiece (15), controllers for milling and drilling operations (6,10) and minicomputer to dispatch tools and the robot control system.
4. The machining cycle begins when the workpieces are fed by a workpiece feeder (1) to the buffer store (2). If the buffer store is overfilled with workpieces the line has to be stopped. If not, the first robot (4) loads the workpieces to and unloads from CNC milling tool (3), gauge them and sort into store cells for milled parts (5).
5. After completion of one operation the control system signals the start for the next one. If the store cell feeding the next robot (8) is overfilled the preceding robot (4) has to be stopped, if not, the cycle continues.
6. Besides feeding the machine tools, the robot performs auxiliary operations. It changes the cutting tools, collects chips and transports the defective workpieces to the transporter.
7. One of the very important parameters of the robot is the speed with which it works. When the robot speed is high the losses due to defective and unfinished

workpieces may increase, when the speed is low the losses decrease but the average production rate also decrease. So that is why the time that the robots may handle the workpieces should be strictly distributed for different operations and controlled from their own controllers.



New words and expressions.

1. robot-assisted technological complexes – роботизированный комплекс
production equipment – промышленное оборудование

2. transfer line – автоматическая линия
CNC = computer numerical control – ЧПУ
3. similar types – одинаковые типы (роботов)
workpiece feeder – устройство, подающее заготовки
buffer store – магазин
output store – накопитель
additional store – дополнительный магазин
controllers – контролирующие устройства
to dispatch tools – распределять инструменты
4. machining cycle – обрабатывающий цикл
to be overfilled with workpieces – переполняться заготовками
to gauge the workpieces – измерять заготовки
store cell – ячейки магазина
5. preceding robot – предыдущий робот
6. auxiliary operations – вспомогательные операции
7. losses – потери
average production rate – средняя производительность
to handle the workpieces – перемещать заготовки
to be strictly distributed – строго распределять

1. Переведите словосочетания на русский язык и составьте с ними предложения:

to connect robots with other production equipment, to create the robot-assisted technological complexes, to dispatch tools, to feed by a workpiece feeder, to be overfilled with the workpieces, to load (to unload) the workpieces, to the CNC milling machine, to sort the workpiece into the store cells, to feed the robot, to continue the cycle, to collect chips, to decrease the losses.

II. Переведите слова и словосочетания на английский язык:

роботизированный комплекс; промышленное оборудование; автоматическая линия; устройство, подающее заготовки; магазин; накопитель; дополнительный магазин; обрабатывающий цикл; ячейки магазина; вспомогательные операции; средняя производительность.

III. Подберите из правой колонки слова, близкие по значению для слов из левой колонки:

to connect	to link
robot-assisted	to measure
transfer line	next
to dispatch	robotized
workpiece	part, work
to gauge	machining line
completion	rate, velocity
overflow	to distributive
subsequent	finishing
speed	overload

IV. Заполните пропуски словами, приведенными ниже:

1. _____ technological complexes are controlled by a central computer.
2. Individually controlled robots are servicing signal _____.
3. The workpiece feeder _____ the workpieces to the buffer store.
4. Minicomputer _____ the tools.
5. _____ of one operation signals the start for the next operation.

6. When the buffer store is _____ed with the workpieces the line has to be stopped.

(robot-assisted, to overflow, to dispatch, completion, dispatch, transfer line)

V. Определите, соответствуют ли данные высказывания содержанию текста. Выразите своё согласие или несогласие с этим высказыванием, употребляя следующие фразы:

a) несогласие, сомнение

On the contrary	- Наоборот
Not at all!	- Совсем нет
Nothing of the kind	- Далеко не так (Отнюдь не так)
Far from it	- Ничего подобного
I am afraid not	- Боюсь, что нет

б) согласие

Yes, certainly!	- Да, конечно!
Yes, of course!	- Да, конечно!
Right you are!	- Вы правы
I quite agree with you!	- Я с вами совершенно согласен
That goes without saying.	- Это само собой разумеется

1. The robots in the technological complexes are programmed individually by a central computer.
2. Robots controlled by a central computer are used in complexes where technological process are performed of single transfer lines.
3. The workpieces are fed by a robot to the buffer store.
4. If the buffer store is overflowed with the workpieces the process continues.

5. The average production rate does not depend on the robot speed.
6. The time that robot may handle the workpieces is not limited.

VI. Поставьте предложения в необходимой последовательности, чтобы соответствовать содержанию текста:

1. One of the very important robot parameters is the speed with which it works.
2. Single transfer lines are controlled by individually controlled robots.
3. It is very important to connect robots with other production equipment.
4. The robots in robot-assisted transfer line perform auxiliary operations.
5. The control system signals the start for the next operation.

VII. Найдите в тексте абзац, где выражено следующее утверждение. Дополните его предложениями из этого абзаца.

1. The robot-assisted transfer line is an integrated technological complex.
2. The operation of the first robot depends on the quantity of workpieces in the buffer store.
3. The time that the robot may handle the workpieces should be strictly distributed.
4. The robot performs auxiliary operations.
5. It is important to connect robots with other production equipment.
6. The control system signals the start for the next operation.

VIII. Найдите в тексте следующие предложения и определите значение слова-заместителя.

... the control system signals the start...

IX. Озаглавьте абзацы текста и составьте по ним сообщения.

- 1.
2. The main parts of the robot-assisted technological complex.
- 3.
- 4.
- 5.
- 6.

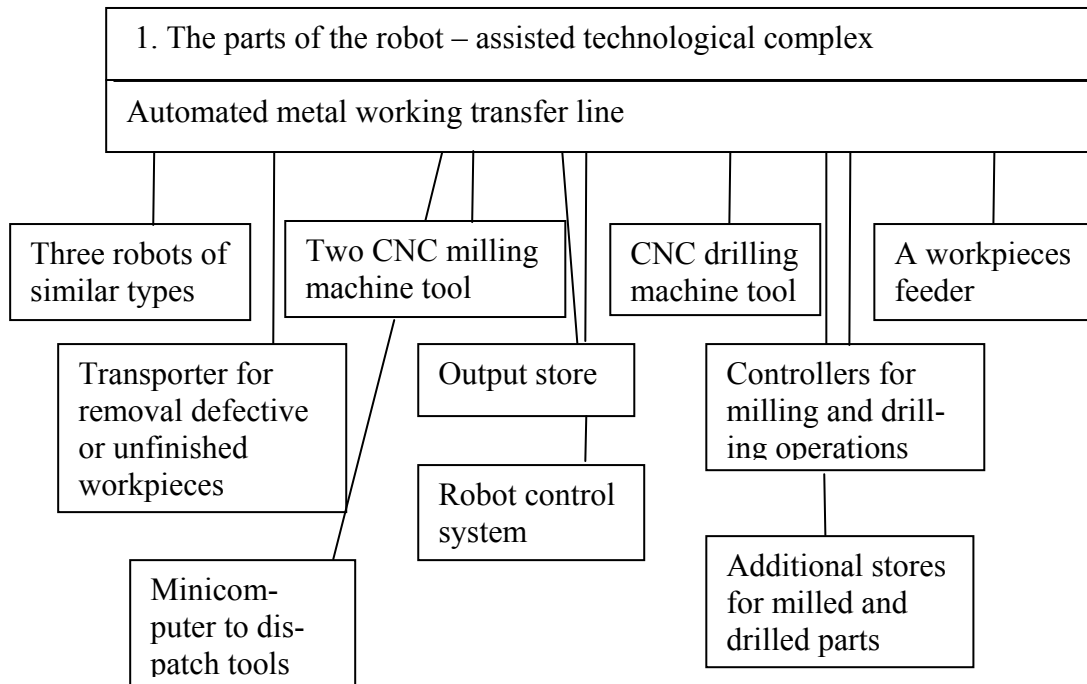
X. Составьте предложения по таблице.

The author	<ul style="list-style-type: none">- presents (представляет на рассмотрение)- treats (рассматривает)- notes (отмечает)- pays attention to (обращает внимание)	<ul style="list-style-type: none">- robot-assisted technological complex.- operation of individually controlled robots.- the start of the machining cycle, the transfer to the next operation.- auxiliary operations performed by a robot.- industrial robot speed parameters.
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XI. Ответьте на следующие вопросы к тексту:

1. What is a technological complex?
2. In what way are the robots in the technological complex programmed?
3. What technological complex is described in this text?
4. What are the parts of the metal working transfer line?
5. When does the machining cycle begin?
6. When does the control system signal the start for the next operation?
7. What auxiliary operations are performed by a robot?
8. When do the losses increase?
9. When do the losses decrease?

XII. Перескажите текст по схеме:



2. The beginning of the machining cycle
3. The transfer from one operation to the next
4. Auxiliary operations performed by a robot
5. Robot speed parameters.

XIII. Abstract, (образец).

- a) The author of the article as noted in the title treats the sequence of robot-assisted technological complex operations.
- b) The author of the article describes the robot-assisted technological complex operation.
- c) The text describes some general problems of the robot-assisted technological complex operation.

XIV. Review.

The title of the article I have read is "Robot-assisted technological complex". The text describes the parts and operation of the robot-assisted technological complex. Here the author pays attention to the beginning of the machining cycle and transfer from one operation to the next. The auxiliary operations performed by a robot are also described here. The author notes the importance of the robot speed parameter. The text contains information which may be of interest to an engineer-designer.

UNIT II. MHU ROBOTS

I. Прочитайте интернациональные слова. Дайте эквиваленты на русском языке, не пользуясь словарем:

а) слова с полным совпадением по форме в двух языках:

press, control, microcomputer, system

б) слова с частичным расхождением в графических образах:

company, produce, type, industrial, pneumatically, programmable, machine, modular, adapt, operation, stamping, pressing, injection, cycle, linear, compact, operate, program, transportation.

II. Прочтите следующие словосочетания, в которых существительное выступает в функции определения и переведите их:

а) casting of dies – die casting

efficiency of production – production efficiency

cycle of operation – operation cycle

- b) molding in the form of injection – injection molding
- c) system of control by microprocessor – microprocessor control system

Text II.

MHU ROBOTS.

1. The leading Swedish robot making company produces three types of industrial robots that are known as Senior, Junior and Minor MHU robots.
2. These robots are pneumatically powered programmable machines. Due to the modular design they are easily adapted to many operations such as die casting, forging, stamping, pressing, welding, injection molding and some machining operations. They are also designed to perform such operations as feeding small parts to presses and assembly machines.
3. The Senior MHU robot handles the workpieces weighing up to 15 kg. It has a flexible telescopic arm which rotates 360° and has the positioning accuracy 0.1 mm.
4. The Junior MHU robot has one, two or three arms. Each arm handles the workpieces weighing up to 5 kg. The Junior robot performs the operating cycle with greater speed than the Senior one and the positioning accuracy remains the same.
5. The Minor MHU robot possesses several arms for handling the workpieces up to 1 kg. The arms produce linear and rotary motions and perform handling operations with small parts at a very high speed. The Minor MHU robot is a small compact robot and is designed to be mounted on the machine. It is the simplest of all and operates in a pick and place mode.
6. All these robots are programmed by a new microprocessor control system. The system stores 255 programs, each of the program contains 255 steps. The

control system can operate up to 20 different programs simultaneously.

7. The MHU Robots are used with the conveyors designed for transportation of different workpieces.

New Words and Expressions

2. due to – вследствие

die casting – отливка штампов

forging – ковка

welding – сварка

injection molding – струйная формовка

3. to handle the workpieces – поднимать заготовки

flexible telescopic arm – гибкая выдвигающаяся рука

4. operating cycle – рабочий цикл

to remain the same – оставаться неизменной

5. pick-and-place mode – цикловой режим

6. to store a program – запоминать программу

to operate a program – управлять программой

simultaneously – одновременно

7. transportation – перемещение

1. Переведите словосочетания на русский язык и составьте с ними предложения:

to feed small parts to presses, to handle the workpieces weighing up to 15 kg, to possesses several arms, to produce linear motions, to perform handling operations, to mount on the machine, to store 255 programs, to operate up to 20 different programs simultaneously.

II. Переведите слова и словосочетания на английский язык:

Модульная конструкция, отливка штампов, струйная формовка, гибкая выдвигающаяся рука, рабочий цикл, цикловой режим, перемещение, операции по перемещению заготовок.

III. Подберите из правой колонки слова, близкие по значению словам из левой колонки:

operating cycle	to run
speed	to have
accuracy	at the same time
to possess	movement
several	to install
motion	working cycle
to mount	velocity, rate
to operate	precision
simultaneously	some

IV. Заполните пропуски словами, приведенными ниже:

1. The Senior robot performs ... with positioning accuracy 0.1 mm.
2. The Minor MHU robot performs the operation cycle with a great
3. The Minor MHU robot ... several arms.
4. The arms of the MHU robots produce linear and rotary
5. The small compact robots are ... ed on the machine.
6. The control system operates up to 20 programs
7. MHU robots operate with a high

(precision, to possess, operating cycle, speed, motions,
to install, simultaneously)

V. Определите, соответствуют ли данные высказывания содержанию текста. Выразите свое согласие или несогласие, употребляя следующие фразы:

a) несогласие, сомнение

I'm afraid it's wrong!

Боюсь, что это неправильно.

Most unlikely!

Маловероятно.

I'm not certain of it!

Я не уверен в этом.

I shouldn't say so!

Я бы не сказал этого.

b) согласие

I think so!

Думаю, что да!

I believe so!

Думаю, что да!

I suppose so!

Полагаю, что да!

I should say so!

Полагаю, что да!

1. Due to the modular design MHU robot cannot be adapted to many operations.
2. The Senior MHU robot has a flexible telescopic arm.
3. The Junior MHU robot handles the workpieces up to 15 kg.
4. The Junior MHU robot performs the operation cycle slowly.
5. The Minor MHU robot possesses one arm.
6. The control system stores 200 programs simultaneously.
7. The conveyor transports parts of different designs and sizes.

VI. Поставьте в необходимой последовательности, чтобы соответствовать содержанию текста:

1. The Senior MHU robot handles the workpieces up to 15 kg.
2. The Junior MHU robot has one, two or three arms.

3. The Minor MHU robot possesses several arms for handling the workpieces up to 1 kg.
4. All these robots are programmed by a new microprocessor control system.
5. The loading Swedish robot making company produces three types of industrial robots.

VII. Найдите в тексте абзац, где выражено следующее утверждение. Дополните его предложениями из этого абзаца.

1. The robot operates under microprocessor control.
2. The Junior MHU robot possesses several arms.
3. MHU robots are adapted to different operations.
4. MHU robots are used with the conveyer.

VIII. Найдите в тексте следующие предложения и определите значение слова-заменителя.

The Junior MHU robot performs the operation cycle

IX. Озаглавьте абзацы текста и составьте по ним сообщение.

1. The loading Swedish robot making company produces three types of industrial robots.
- 2.
- 3.
- 4.
- 5.
- 6.

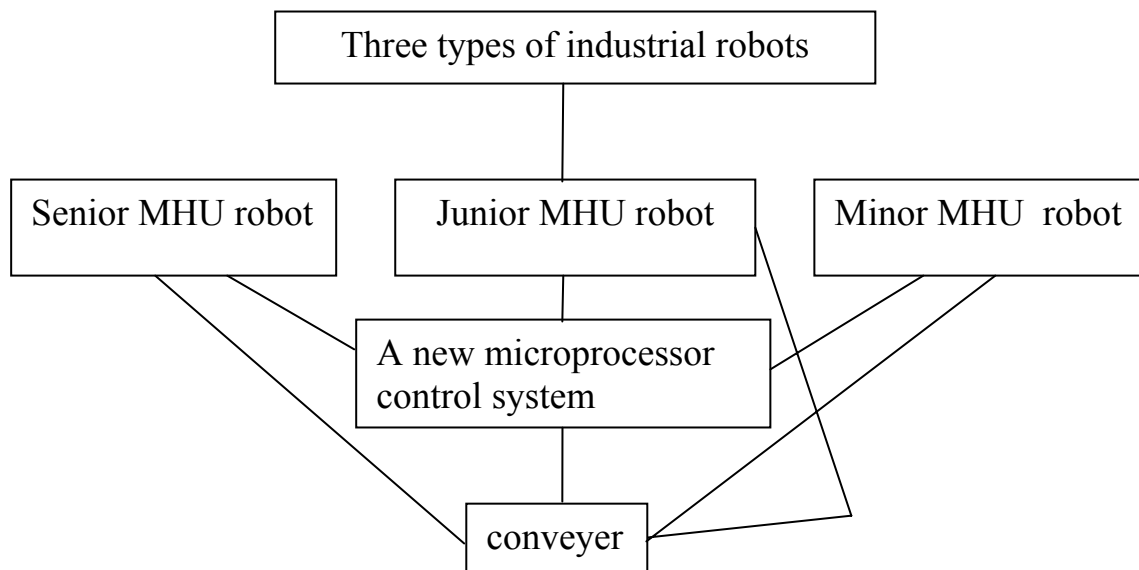
X. Составьте предложения по таблице:

The text	<ul style="list-style-type: none">- deals with (в тексте говорится о)- reveals (раскрывает)- describes (описывает)	<ul style="list-style-type: none">- specifications of the MHU robots- operations performed by robots- the configuration of the Minor MHU robots- the microprocessor control system
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XI. Ответьте на следующие вопросы по тексту:

1. What types of robot does the leading Swedish company produce?
2. What are the specifications of the MHU robots?
3. What operations are produced by MHU robots?
4. What are the specifications of the Senior MHU robot (Junior, Minor MHU robot)?
5. By what are the MHU robots programmed?
6. What are the conveyers used for?

XII. Перескажите текст по схеме:



XIII. Составьте аннотацию и реферат к тексту по образцу урока I.

UNIT III. THE ROBOT MACHINING COMPLEX FOR TURBINE BLADE GRINDING AT ROLLS ROYCE

I. Прочитайте интернациональные слова. Дайте эквиваленты на русском языке, не пользуясь словарем:

а) слова с полным совпадением по форме в двух языках:

control, class, stop, transport

б) слова с частичным расхождением в графических образах:

turbine, pallet, conveyor, microprocessor, system, technology, mechanical, positioning, telescopic, linear, adapt, cycle, critical, guarantee, disorient, service, orientation

II. Прочтите следующие словосочетания, в которых существительное выступает в функции определения, и переведите их:

а) grinding of turbine blades – turbine blade grinding

pallet conveyor of 95 meters – 95 meters pallet conveyor

robots of low technology – low technology robots

positions of pick up – pick up positions

distortion of parts – part distortions

parameters of machine tools – machine tool parameters

cost of production – production cost

- b) control system with microprocessors – microprocessor control system
machines with three axis – three axis machines
handling with robots – robot handling
- c) positioning of mechanical stops with high accuracy – high accuracy mechanical stop positioning

Text III

The Robot Machining Complex for Turbine Blade Grinding at Rolls Royce.

1. The new machining line for turbine blade grinding which consists of 12 machines grinding machines is installed at Rolls Royce. It is equipped with 7 Senior MHU Robots, a 95 meter pallet conveyor and a microprocessor control system.
2. The robots in the line are Senior MHU's. They are classed as low technology robots but have the advantage of a high accuracy mechanical stop positioning. They are three-axis machines which are provided with a telescopic arm and a rotary wrist. The wrist possesses one or two linear motions for feeding the parts to the grinding machines. The gripper of the robot is designed to adapt to various pick up positions and to avoid the distortion of the part.
3. At present, the operating cycle begins when an operator removes the blade from the stack and places it on the pallet. The conveyor transports the palletized blade to the pick-up station where the robot picks it up and feeds it to the grinding machine.
4. Accuracy of positioning of the pallet at the pick-up station is critical. The blade has to be positioned in four different orientations with the accuracy of 0.03 mm. First, the pallet conveyor could not guarantee the required accuracy. So it was decided to use a pair of pivoting fingers. When a pallet arrives at the pick-

up station, it is locked in a position by a pneumatic clamp. Then the pivoting fingers swivel it around so that the part can not be disoriented.

5. The grinding machines are arranged in pairs with one robot servicing a pair of machines. So six robots are servicing the line of 12 grinding machines while the seventh robot will be used to automate the operation subsequent to the grinding one.

6. The line is designed to machine five varieties of blades. Rolls Royce produces one type of blades for a period of three weeks, producing about 250 blades a day. Then it is programmed to produce another type of blade. To reprogram the line from production of one type of blades to another it is necessary to change some programming parameters. This usually takes three days but the time should be reduced to the duration of one shift.

7. Automating the grinding of the turbine blades with the introduction of robots is expected to reduce the cost of production and improve the quality of the robots.

New Words and Expressions.

1. machining line – обрабатывающая линия
turbine blade – лопасть турбины
grinding – шлифовка
grinding machine – шлифовальный станок
to grind (ground) – шлифовать
to install — устанавливать
pallet – паллета (вспомогательный стол с гнездами)
pallet conveyor – конвейер с паллетами
to palletize – положить на паллету
2. mechanical stop positioning – позиционирование с помощью механических упоров

- telescopic arm – выдвигающаяся рука
rotary wrist – шарнирная рука
gripper – захватывающее устройство
pick up positions – точки захвата
distortion – разрушение
3. stack – стеллаж
 4. pivoting fingers – вращающиеся пальцы
to lock – зажимать
clamp – зажим
to swivel around – обхватывать
 5. to arrange – располагаться
to service – обслуживать
subsequent to – последующий, следующий за
 6. duration – на протяжении
shift – смена
 7. introduction – введение
to reduce – уменьшить
cost of production – стоимость производства
to improve the quality – улучшить качество

1. Переведите словосочетания на русский язык и составьте с ними предложения:

to consist of 12 grinding machines, to install a new machining line, to provide with a rotary wrist, to palletize a blade, to transport to the pick-up station, to lock in position, to disorient the part, to arrange in pairs, to secure a pair of machines, it takes three days, to reduce time to the duration of one shift, to improve the quality of the parts.

II. Переведите словосочетания на английский язык:

обрабатывающая линия, лопасть турбины, шлифовальный станок, конвейер с паллетами, низкотехнологические роботы, позиционирование с помощью механических упоров, работы с тремя осями движения, точки захвата, рабочий цикл, помещенная на паллету лопасть, точность позиционирования, требуемая точность, вращающиеся пальцы, последующие операции, на протяжении одной смены, стоимость продукции.

III. Подберите из правой колонки слова, близкие по значению для слов из левой колонки:

machining line	price
axis of motion	worker
part	transfer machine
distortion	position
at present	degrees of freedom
operating cycle	to put
to begin	workpiece
to arrange	to take off
to remove	failure, breakage
operator	to lay out
to palletize	currently
accuracy	to move
cost	to start
orientation	precision
to provide	to equip
to transport	working cycle

IV. Заполните пропуски словами, приведенными ниже:

1. A new _____ was installed at Rolls Royce.
2. The Senior MHU robot is _____ed with a rotary wrist.
3. An operator _____s the blade from the stack.
4. The conveyor _____s the palletized blade to the pick-up station.
5. The blade is positioned in four different _____s.
6. The machines are _____ed in pairs.
7. The positioning _____ of the pallet at the pick-up station is critical.
8. The robot has 3 _____.

(to provide, machining line, to arrange, degrees of freedom,
accuracy, to remove, to transport, orientation)

V. Определите, соответствуют ли данные высказывания содержанию текста. Выразите свое согласие или несогласие, употребляя следующие фразы:

a) несогласие, сомнение

- | | |
|-------------------------|---------------------------|
| I doubt that | – Я сомневаюсь в этом |
| It's most doubtful that | – Весьма сомнительно, что |
| It's most unlikely that | – Едва ли, что |
| It's hardly likely that | – Менее всего вероятно |

b) согласие

- | | |
|--|-----------------------------|
| It is common knowledge that | – Всем хорошо известно, что |
| It is a well-known fact that | – Хорошо известно, что |
| It is generally recognized that (considered) | – Обычно считается, что |

1. The operating cycle begins when the operator removes the blade from the stack and feeds it to the grinding machine.
2. The blade is positioned in four different orientations.
3. The conveyor transports the palletized blade to the pick up station where the robot picks it up.
4. Seven robots are servicing the line of 12 grinding machines.
5. Reprogramming usually takes the duration of one shift.

VI. Поставьте предложения в нужной последовательности, чтобы соответствовать содержанию текста:

1. The robots are classed as low technology robots but have the advantage of a high accuracy mechanical stop positioning.
2. First, the pallet conveyor could not guarantee the required accuracy.
3. The new machining line for turbine blade grinding is installed at Rolls Royce.
4. The grinding machines are arranged in pairs with one robot servicing a pair of machines.
5. Automating the grinding of the turbine blades with the introduction of robots is expected to reduce the cost of production and improve the quality of the parts.

VII. Найдите в тексте абзац, где выражено следующее утверждение. Дополните его предложениями из этого абзаца.

1. The operating cycle begins when the operator removes the blade from the stack.
2. The line is designed to machine five varieties of blades.
3. The grinding machines are arranged in pairs.

4. The robots in line are Senior MHU's.
5. The blade has to be positioned with the accuracy of 0.03 mm.

VIII. Найдите в тексте следующее предложение и определите значение слова-заместителя:

... six robots are servicing the line of 12 grinding machines ...

IX. Озаглавьте абзацы текста и составьте по ним сообщение:

1. The parts of the new machining complex for turbine blade grinding.
2. Characteristics (specifications) of the Senior MHU robots.
- 3.
- 4.
- 5.
- 6.
- 7.

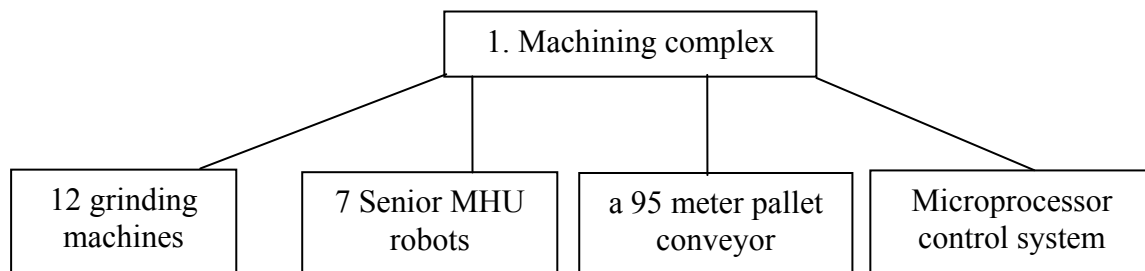
X. Составьте предложения по таблице:

The author	<ul style="list-style-type: none"> - describes (описывает) - deals with (рассматривает) - mentions (упоминает) - outlines (описывает в общих чертах) - points out (указывает) - stresses (подчеркивает) - emphasizes (выделяет) 	<ul style="list-style-type: none"> - the parts of the machining complex. - specifications of the Senior MHU robots. - the beginning of the operating cycle. - what guarantees the required accuracy. - the arrangement of robots in the complex. - reprogramming of the line.
------------	--	---

XI. Ответьте на следующие вопросы по тексту:

1. What line is installed at Rolls Royce?
2. What are the specifications of the Senior MHU robots?
3. When does the operating cycle begin?
4. What provides the positioning accuracy of the blade?
5. What is the arrangement of robots and grinding machines in the machining complex?
6. In what way is the machining line reprogrammed?
7. What is the automating of the grinding of the turbine blades expected to achieve?

XII. Перескажите содержание текста по схеме:



2. Specifications of the Senior MHU robots.
3. Operating cycle
4. Improvements in the pallet conveyor.
5. Arrangement of robots and grinding machines in the machining complex.
6. Reprogramming of the machining line.

XIII. Составьте аннотацию и реферат к тексту.

UNIT IV. NEW FANUC PLANT USES FMS

I. Прочитайте интернациональные слова. Дайте эквиваленты на русском языке, не пользуясь словарем:

а) слова с полным совпадением по форме в двух языках:

monitor, motor, computer

б) слова с частичным расхождением в графических образах:

system, manufacturing, spindle, cylindrical, center, moment, conveyor, telescopic, camera, pallet, standard

II. Прочтите следующие словосочетания, в которых существительное выступает в функции определения, и переведите их:

capacity per month – month capacity

motor with spindle – spindle motor

shop for machines – machine shop

shop for assembly – assembly shop

robot for assembly – assembly robot

changer for pallets – pallet changer

table of the machine – machine table

room for control – control room

building having two storeys – a two storey building

Text IV

New Fanuc Plant uses FMS (Flexible Manufacturing System).

1. The Japanese firm Fanuc has installed FMS at a new plant for producing different types of spindle motor.
2. The new plant is a two storey building with a machine shop on the ground floor and an assembly shop on the first floor equipped with CNC handling and assembly robots. The large automatic warehouse extends from the ground floor up through to the first floor. The whole plant is controlled by a host computer. The plant produces both ac and dc motors. It has the capacity of 10.000 motors of 40 kinds per month.
3. In the machine shop there are 60 NC machines, and 52 of these are loaded and unloaded by robots. The machines are arranged in five rows. Four of them consist of 44 NC lathes and 8 NC cylindrical grinders. The fifth row consist of the large machining centers with the automatic pallet changers. Two unmanned trolleys transfer standard pallets with the workpieces to the robots. The robots equipped with two telescopic grippers pick up workpieces from a stack and transfer it to a machine table.
4. Twenty one men work on one shift in the machine shop. They maintain the machines and robots. The machines operate unmanned for the other two shifts with only one man in the control room. Twenty one cameras in the machine shop show in three monitors what is happening at the present moment. The machine shop operates for 24 hours a day.
5. On the first floor there is an assembly shop with 49 robots arranged in 25 cells. The robots are arranged in four rows linearly and workpieces are transferred between cells by conveyors. The assembly shop operates only 8 hours a day because 35% of the assembly is done manually. But these operations will be automated soon.

New words and expressions

1. to install – устанавливать

Flexible Manufacturing System (FMS) – гибкая производственная система
(ГПС)

spindle motors – двигатель с распределительным валом

2. to equip with robots – оснащать роботами

CNC handling robot – программный манипуляционный робот

CNC assembly robot – программный сборочный робот

automatic warehouse – автоматизированный склад

to extend from...to... – располагаться от...до...

a host computer – центральный компьютер

ac motor (alternating current) – двигатель переменного тока

dc motor (direct current) – двигатель постоянного тока

capacity (of the plant) – производительность

per month – в месяц

3. to arrange in rows – располагать рядами

to arrange in five rows – располагать пятью рядами

NC cylindrical grinder – числовой цилиндрико-шлифовальный станок

automatic pallet changer – автоматическое устройство для смены паллет

unmanned trolley – автоматическая тележка

4. telescopic gripper – втягивающийся захват

stack – стеллаж

5. shift – смена

to work on one shift – работать в одну смену

to maintain (machines, robots) – обслуживать (станки, роботов)

6. to operate unmanned – работать автоматически

to happen – происходить

I. Переведите словосочетания на русский язык и составьте с ними предложения:

to install FMS, to be equipped with CNC handling and assembly robots, to extend from the ground floor up through to the first floor, to arrange in five rows, to transfer standard pallets, to be equipped with telescopic grippers, to pick up a workpiece from a stack, to transfer a workpiece to a machine table, to maintain the machines (robots), to operate unmanned, to happen at the present moment, to operate for 24 hours a day.

II. Переведите слова и словосочетания на английский язык:

ГПС (гибкая производственная система), двигатель с распределительным валом, программные манипуляционные роботы, автоматизированный склад, центральный компьютер, двигатели переменного и постоянного тока, производительность, в месяц, числовой цилиндрический станок, автоматическая тележка, автоматическое устройство для смен паллет, смена, механический цех, вручную.

III. Подберите из правой колонки слова, близкие по значению для слов из левой колонки:

to install	host computer
type	to comprise of
to produce	automatic
capacity	work, part
to transfer	kind
to consist of	to serve
unmanned	to turn out, to manufacture

workpiece	to work
to maintain	productivity
to operate	to transport
central computer	to equip with

IV. Заполните пропуски словами, приведенными ниже:

1. The Japanese firm Fanuc has _____ed FMS for producing spindle motors.
2. The machine shop is located at the _____ floor.
3. The automatic warehouse _____s from the ground floor up through to the first floor.
4. The plant produces 10.000 of _____ per month.
5. The machine shop is equipped with NC lathes, NC cylindrical grinders and _____.
6. Robots are equipped with _____ grippers.

(telescopic, to extend, ac and dc motors, NC machining centers, ground, to install)

V. Определите, соответствуют ли данные высказывания содержанию текста. Выразите свое согласие или несогласие с этими высказываниями, употребляя следующие фразы:

a) несогласие, сомнение

- | | |
|---------------------|-----------------------|
| Far from it! | - Далеко не так! |
| I shouldn't say so! | - Я не уверен в этом! |
| I doubt that! | - Я сомневаюсь! |

б) согласие

- I quite agree with you! - Я с вами совершенно согласен!
I believe so! - Полагаю, что да!
It is generally recognized (considered) ... - Обычно считается...

1. The new Fanuc plant consists of a machine shop and an assembly shop and a large warehouse.
2. The plant produces ac and dc spindle motors with the capacity of 10.000 motors per month.
3. The machine shop is not equipped with robots.
4. The plant works on three shifts.
5. The assembly shop is a wholly automated shop.

VI. Поставьте предложения в необходимой последовательности, чтобы соответствовать содержанию текста:

1. The assembly shop operates only 8 hours a day because 35% of the assembly is done manually.
2. The new plant is a two storey building with a machine shop on the ground floor and an assembly shop on the first floor.
3. Twenty-one cameras in the machine shop show in three monitors what is happening at the present moment.
4. Twenty-one men work on one shift in the machine shop.
5. In the machine shop there are 60 NC machines, and 52 of these are loaded and unloaded by robots.
6. The robots equipped with two telescopic grippers pick up workpieces from a stack and transfer it to a machine table.

VII. Найдите в тексте абзац, где выражено следующее утверждение. Дополните его предложениями из текста:

1. The new plant is a two-storey building.
2. The assembly shop operates only 8 hours a day.
3. Twenty-one men work on one shift in the machine shop.
4. In the machine shop there are 60 NC machines, and 52 of these are loaded and unloaded by robots.

VIII. Озаглавьте абзацы текста и составьте по ним сообщения.

IX. Ответьте на вопросы к тексту:

1. What new equipment was installed by the Japanese firm Fanuc?
2. What is the lay out of the plant?
3. What is the capacity of the plant?
4. What is the machine shop equipped with?
5. What is the work force of the shop?
6. Working hours for the staff?
7. How does the system of control operate?
8. What are the principles of robot arrangement in the assembly shop?

X. Составьте схему текста для пересказа.

XI. Составьте аннотацию и реферат к тексту.

UNIT V. 18 ROBOT ARC WELDING LINE

I. Прочитайте интернациональные слова. Дайте эквиваленты на русском языке, не пользуясь словарем:

а) слова с полным совпадением по форме в двух языках:

operator, disk, model, gas, minicomputer

б) слова с частичным расхождением в графических образах:

traditional, module, manufacture, fabricate, centre, program

II. Прочтите следующие словосочетания, в которых существительное выступает в функции определения и переведите их:

line of 18 robots arc welding – 18 robot arc welding line

housing of an axle – axle housing

axle of a truck – truck axle

axle of a bus – bus axle

plate of steel – steel plate

line for production in the form of a conveyor – conveyor production line

arc welder for metal by means of gas – gas metal arc welder

station for welding – welding station

program for robot – robot program

panel for control – control panel

functions of programming – programming functions

Text V

18 robot arc welding line

1. 18 robot arc welding line for welding axle housing was the first of its type in North America. It was installed at the Barrie plant in Ontario, 50 miles north of Toronto. The line was designed to replace a traditional mechanical welding line equipped with single robots.
2. The welding robots are arranged in 6 computer — controlled welding modules working independently of each other. The robots in the line can be quickly reprogrammed to weld 33 different models of heavy-duty axle housings, many of these go to several leading manufacturers of trucks and buses.
3. Since the robots must weld heavy steel plates they have a 500 lb payload are much different from the articulated arm that can handle only about 50 lb.
4. The axle housing is fabricated at six welding stations on a conveyor production line by using gas metal arc welders. Each of the welding station is controlled by a minicomputer tied into a host computer.
5. There are two programming centers. One of them ties into the host computer, assembling and linking stored robot programs, and transmitting them to the minicomputer. The second centre is used as a back up to develop and test programs.
6. At each welding station there is a control panel. This means the operator can operate his station in the manual mode or the automatic mode. All the changeovers are kept on floppy discs. So, to go from one mode of an axle housing to the next it is necessary to change the program.
7. Highly qualified operators were carefully selected and trained to do all programming functions.

New words and expressions

- 1) arc welding – дуговая сварка
18 robot arc welding line – линия из дуговой сварки из 18 роботов
to weld – сварить
axle – ось
axle housing – корпус оси
to replace – заменять
single – одиночный
- 2) to arrange in modules – располагать модулями
to work independently of each other – работать не зависимо друг от друга
heavy-duty – крупный, мощный
several – несколько
truck – грузовик
- 3) since – так как
steel plate – стальная пластина
articulated arm – многозвенная рука
- 4) to fabricate – изготавливать
gas metal arc welders – аппараты для дуговой сварки
to tie into – соединяться с ...
to tie into a host computer – соединяться с главным компьютером
- 5) to link – соединять
to link stored robot programs – соединять программы для роботов, хранящиеся в памяти
back up – дублирующая система
- 6) control panel – щиток контроля
to mean this means – обозначать, это обозначает
to operate – управлять

changeover – изменения

to keep (kept) on floppy discs – хранить на гибких дисках

necessary – необходимый

it is necessary – необходимо

to be carefully selected – тщательно отбираться

I. Переведите словосочетания на русский язык и составьте с ними предложения:

to install 18 robot arc welding line, to weld axle housing, to replace traditional mechanical welding line, to equip with single robots, to arrange in 6 computer - controlled welding modules, to work independently of each other, to be fabricated at six welding stations, to tie into a host computer, to operate his station in the manual mode (automatic mode), to keep (kept) on floppy discs, it is necessary.

II. Подберите из правой колонки слова, близкие по значению для слов из левой колонки:

to fabricate	- to direct
host computer	- to link
to tie	- conventional
to operate	- to manufacture
type	- to mount
to install	- jointed arm
traditional	- to choose
module	- central computer
quickly	- kind

manufacturer	- weight carrying capacity
payload	- rapidly
articulated arm	- producer
to select	- cell, workcell

III. Заполните пропуски словами, приведенными ниже:

1. 18 robot arc welding line for welding ... was installed at the Barrie plant.
2. The welding robots are arranged in 6 computer-controlled welding
3. Robot must weld heavy steel
4. The axle housing is ...ed at six welding stations on conveyor production line.
5. Each of the welding station is controlled by a
6. The programming centre assembles and links the ... robot programs.
7. The operator can operate his station in the ... mode.

(manual, minicomputer, modules, axle housing, plates, to fabricate, stored)

IV. Определите, соответствуют ли данные высказывания содержанию текста. Выразите свое согласие или несогласие с этими высказываниями, употребляя следующие фразы:

a) несогласие, сомнение

I don't think so!	- Думаю, что нет (что это не так).
Most unlikely!	- Это маловероятно.
I'm afraid not!	- Боюсь, что нет.
On the contrary!	- Наоборот!

b) согласие

Exactly!	- Именно так!
Quite so!	- Именно так!

I think so!	- Думаю, что да.
I suppose!	- Полагаю, что да.
Yes, certainly!	- Да, конечно.

1. 18 robot arc welding line for welding axle housing was installed to replace a traditional mechanical welding line equipped with single robots.
2. The welding robots are largely dependent on each other.
3. The robots in the line cannot be reprogrammed.
4. The production of the Barrie plant is not competitive.
5. The axle housing is fabricated at one station.
6. Each of the welding station is controlled by a minicomputer tied to a host computer.
7. There is a single programming centre.
8. The control panel is mounted at the first welding station.

V. Поставьте предложения в необходимой последовательности, чтобы соответствовать содержанию текста:

1. The axle housing is fabricated at six welding stations.
2. The welding robots are arranged in 6 computer-controlled welding modules.
3. The robots in the line can be quickly reprogrammed to weld 33 different models.
4. There are two programming centers.
5. All the changeovers are kept on floppy discs.
6. 18 robot arc welding line for welding axle housing was the first of its type in North America.

VI. Найдите в тексте абзац, где выражено следующее утверждение. Дополните его предложениями из текста.

1. The axle housing is fabricated at six welding stations.
2. There are two programming centers.
3. At each welding station there is a control panel.
4. The robots have a 500 lb payload.

VII. Озаглавьте абзацы текста и составьте по ним сообщения:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

VIII. Найдите в тексте следующее предложение и определите значение слова-заменителя.

... many of these go to several leading manufacturers

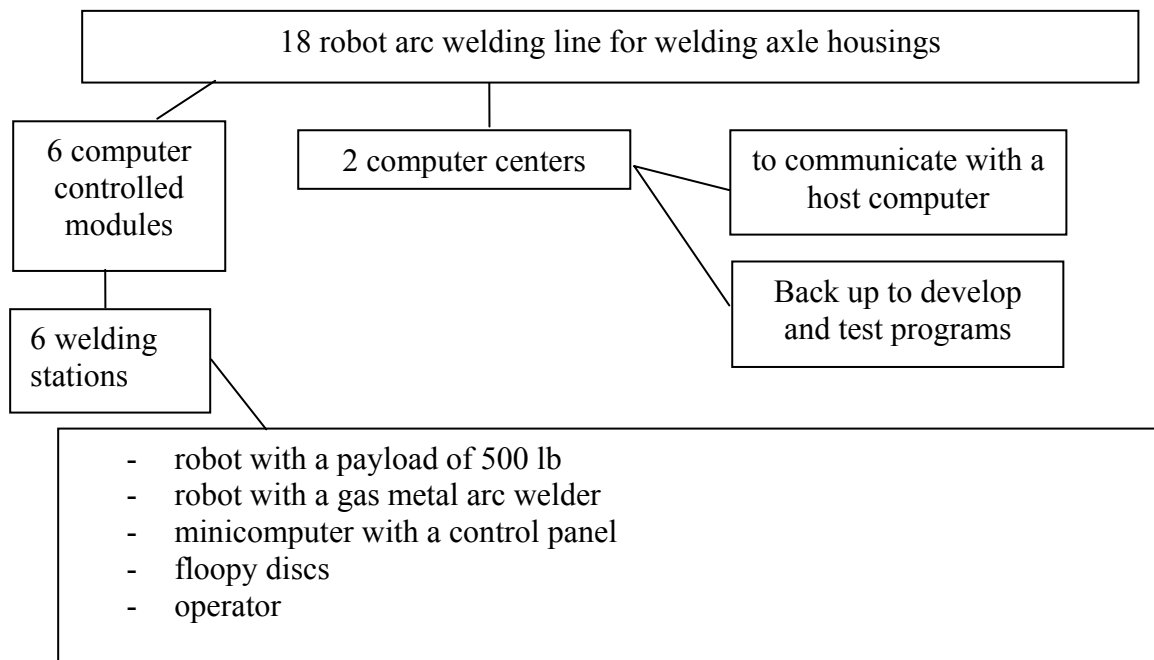
IX. Составьте предложения по таблице:

The text	<ul style="list-style-type: none"> - describes (описывает) - deals with (в тексте говорится о) - reveals (раскрывает) 	<ul style="list-style-type: none"> - 18 robot arc welding line for welding axle housing arrangement of welding robots in a cell. - some specifications of welding robots. - control of the robot arc welding line. - changing of the program. - operating of a single welding station.
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X. Ответьте на вопросы к тексту:

1. What line was installed at the Barrie plant?
2. What line has this line replaced?
3. In what way are the welding robots arranged?
4. How many models of axle housing can be welded on the line?
5. What is the payload of the welding robots?
6. How many welding stations has the welding line?
7. What controls each welding station?
8. What welders are used at the welding line?
9. What are the functions of the programming centers?
10. Who is a control panel used for?
11. Who serves the welding line?

XI. Перескажите текст по схеме:



XII. Составьте аннотацию и реферат к тексту.

Self Instruction Task for Individual Reading

I. Read the new words and memorize them.

Robot slashes loading time.

to slash loading time – резко сократить время загрузки

to produce turn-out plates – производить перемычки для перевода ж/д стрелки

to mill, milling – фрезеровать, фрезерование,

a horizontal milling machine – горизонтально-фрезерный станок

to carry out milling – выполнять фрезерование

to operate for 2 or 3 shifts – работать в 2-3 смены

1. What can you say about the Weston Shops of Canadian Pacific Railroad in Winnipeg?

to upgrade the work of the shop – улучшать работу завода

to install a new machine – устанавливать новый станок

carbide tooling – твердосплавный инструмент

to machine 60-75 plates per shift – обрабатывать 60-75 перемычек в смену

plates of different versions – перемычки различных типов

manually – вручную

to account for 4-5 minutes – насчитывать (составлять) 4-5 минут

2. Tell what was done to upgrade the work of the Weston Shops. Tell of the advantages and disadvantages of a new Cincinnati vertical milling machine with the carbide tooling.

to become apparent – становиться очевидным

total operating time – полное время обработки

Unimation company Inc. – компания «Юнимейшн»

to triple the productivity /TRJPL/ – утроить производительность

under the supervision of the company engineers – под наблюдением инженеров компании

3. What did the company do to increase the productivity of the vertical milling machine?

to turn 180 degrees to the right – поворачивать на 180° вправо

to grasp a plate at the delivery point – захватывать перемичку из положения подачи

incoming parts conveyor – конвейер с поступающими заготовками

to actuate the hydraulic clamps of the fixture – приводить в действие гидравлические зажимы фиксатора

to wait – ждать

to complete the machining cycle – заканчивать обрабатывающий цикл

part conveyor – конвейер с деталями

to initiate a part conveying cycle – начинать цикл подачи заготовки по конвейеру

to push the full magazine – толкать заполненный магазин

to displace the empty magazine – вытеснять пустой магазин

the outgoing conveyor – конвейер с отправляемыми заготовками

the auxiliary hydraulic controller – вспомогательное гидравлическое контролирующее средство

to release pressure on the fixture clamps – ослаблять напряжение на зажимах фиксатора

to (un) load the milling machine – загружать (разгружать) фрезерный станок

to actuate air jets – приводить в действие воздушный эжектор

to blow chips from the machine's worktable – сдуть стружку с рабочего стола станка

to deposit the turn-out plate on a matrix – положить перемичку для ж/д стрелки на матрицу

a wooden pallet – деревянная паллета

step – шаг

4. Tell about the working cycle of the Unimate industrial robot. What functions does it perform on each stage?

milled slots – вальцованные пазы

in this case – в этом случае

the initial drop-off point – начальная точка приема заготовок

top – верхняя часть

pallet – паллета

to palletize the finished plate on a matrix – помещать готовую перемычку в матрицу паллеты

jib-crane – кран-укосина

5. Describe the process of making the second cut.

identical ends – одинаковые края

a tape cassette library – библиотека для кассет с магнитной лентой

6. Tell why a tape cassette library for programming is used.

/plug-in/ program storage and verification unit (PS&V unit) – блок хранения программы и контроля (БХ и К)

to store programs – хранить программы

7. What additional equipment was installed by the company for storing programs on the magnetic tape cassettes?

production lot, to insert the cassette into PS&V unit - производственная партия, вставлять кассету в БХ и К

to replace the previous program – заменять предыдущую программу

to unplug the PS&V unit – выключать БХ и К

to initiate the work cycle – начинать цикл обработки

8. Describe the process of changing the program.

to satisfy the company – удовлетворить компанию

safety and production aspects – факторы безопасности и производительности

initial estimates – первоначальные подсчеты

to have forecast – предсказывать

to pay for itself – окупать стоимость

9. Why was the company satisfied with the work of the machineloaded industrial robot?

II. Read the text using the list of new words and answer the questions.

Robot slashes loading time

Weston Shops of Canadian Pacific Railroad in Winnipeg is producing turn-out plates for 40 years. Milling of the turn-out plates is carried out on a horizontal milling machine which operates for 2 or 3 shifts.

To upgrade the work of the Weston Shops the company has installed a Cincinnati vertical milling machine with carbide tooling. It machine 60-75 plates of different versions per shift. Loading of this machine was carried out manually and accounted for 4-5 minutes per a plate. So, it soon became apparent that the machine was cutting metal only 20 per cent of total operating time.

After some talk a Unimate machine-loading industrial robot manufactured by Unimation Inc. was installed at the Weston Shops under the supervision of the company engineers.

Though the robot operated for one or two shifts it more than tripled the productivity of the machine.

Typical operating cycle

A typical work cycle of the robot for machining turn-out plates with one milling slot is as follows:

1. The robot turns 180 degrees to the right and grasps a plate at the delivery point of the incoming parts conveyor.

2. Turning 90 deg to the left, it places the plate in a fixture on the table of the milling machine and actuates the hydraulic clamps of the fixture.
3. The industrial robot starts the milling machine and waits until the machining cycle is complete.
4. While waiting the robot controls the part conveyor. When no plates remain on the conveyor the Unimate Initiates a part conveying cycle. First, a hydraulic cylinder pushes the next full magazine until the full magazine is positioned where the empty one had been. Then hydraulic cylinder pushes the empty magazine onto the outgoing conveyor.
5. The milling machine signals the Unimate that the machining cycle is completed and instructs an auxiliary hydraulic controller to release pressure on the fixture clamps to unload the milling machine.
6. The robot actuates air jets to blow chips from the machine's worktable.
7. The robot unloads the milling machine and deposits the turn-out plate on a matrix of a wooden pallet and begins the cycle again with step №1.

Milling two slots

Most turn-out plates have two milled slots with the slot on the second and being different from that on the first. In this case the initial drop-off point for the Unimate is on the magazine and not on the pallet. An assistant with a jib crane transfers the magazines to the incoming conveyor. The robot removes the plate from the fixture and immediately loads it back for a second cut at the opposite end. Upon completion of second cut the Unimate palletizes the finished plate on a matrix.

Cassette tape programming

The milling machine is designed to make slots on the turn-out plates of more than 100 versions. Only one or two of these turn-out plates have identical ends. To reprogram the machine and the robot for making different types of slots a

tape cassette library for programming is used.

The company has installed a plug-in program storage and verification unit from Unimation for storing programs on the magnetic tape cassettes.

At the start of the production lot the operator takes the cassette with the program and inserts it into the PS&V unit loading the program into the robot's memory where it replaces the previous program.

The machine operator then unplugs the PS&V unit, changes the fixture if necessary and initiates the work cycle.

The machine-loading robot satisfied the company from both safety and production aspects. Initial estimates had forecast that the robot would pay for itself after 1, 2 years of operation.

III. Test yourself.

turn-out plates, milling, horizontal milling machine, vertical milling machine, carbide tooling, loading, total operating time, machine-loading industrial robot, productivity of the machine, operating cycle (work cycle), (machining cycle), milled slot, delivery point, incoming parts conveyor, part conveyor, outgoing conveyor, fixture, hydraulic clamps of the fixture, a part conveying cycle, magazine (full m., empty m.), auxiliary hydraulic controller, air jets, chips machine's worktable, matrix, wooden pallet, stop, initial drop-off point, jib crane, cassette tape programming, version, tape cassette library, plug-in program storage and verification unit (PS&V unit), production lot, the robot's memory, safety, initial estimates, manually, immediately, in this case.

IV. Divide the text into sense groups and give the main idea of each group.

V. Give the title to each sense group and make up a plan.

VI. Reproduce the text according to the plan.

"MY SPECIALITY"

(Automation and advanced mechanization of industry. Robotized Systems)

1. One of the most important problem in machine-building nowadays is the introduction of the latest types of machine tools and modernizing of the equipment with have been already installed. The plants produce many numerically controlled (NC) machine tools, complex machining centers and electronic equipment for automated factories.
2. The first semi-automatic machine tools were invented in 1954. They performed the processing operations automatically. The workers had only to load and unload the workpieces.
3. The further progress in machine-building is impossible without application of the latest achievements in numerical control and electronic equipment.
4. NC machine tools represent the first step in application of computers to the control of machine tools. NC machine tools increase productivity by 300 to 400 percent and improve product quality at the same time.
5. The latest types of NC machining centers are equipped with automatic toolchanging and workchanging devices. They perform several operations at a single set up of the workpiece and reduce the production time to a minimum.
6. NC machine tools and machining centers are the fundamental blocks of automated factories that will appear in the nearest future. The automated factories are large integrated manufacturing systems, in which auxiliary,

assembly and inspection operations are performed automatically. Several operators control the manufacturing process from a single computer centre.

7. There are two approaches to automation of auxiliary operations at the automated factories. One way is to use conveyor systems which will transfer works on the pallets from one machine tool to another. Another way is to use industrial robots for loading and unloading operations.

8. Industrial robots are widely used nowadays for performing assembly, welding, painting and other operations, that are monotonous or dangerous for health.

9. Specialists in the field of automation and robot systems are trained at the departments of mechanics in higher technical schools.

10. Future specialists study many special subjects such as design of automatic machine tools and automated lines, numerical control of production processes, automation of loading and unloading operations, computer aided design (CAD) and computer aided manufacturing (CAM), production of robots, etc. They have practical training at leading industrial enterprises of our country where they may apply their theoretical knowledge in practical work. The future engineers will be able to solve many scientific and engineering problems in automation and robotization of the manufacturing processes.

I. Заучите новые слова и словосочетания:

introduction, to install, numerical control (NC), machining centre, to load, to unload, application, to represent, to improve, to perform, at a single set up of a workpiece, to reduce, auxiliary operations, (approach) to transfer, pallet, assembly, welding, painting, dangerous, computer aided design (CAD), computer aided manufacturing (CAM).

II. Найдите в тексте ответы на следующие вопросы:

1. What is the most important problem in machine-building nowadays?
2. When were the first semi-automatic machine tools invented?
3. What is the further progress in machine-building based on?
4. What helps to increase the productivity of machine tools?
5. What helps to reduce the production time of the machining centers to a minimum?
6. What is an automated factory?
7. What are the two approaches to automation of auxiliary operations?
8. What operations are performed by robots?
9. Where are the specialists in the field of automation and robot systems trained?
10. What subjects do the future specialists study?

III. Заполните пропуски следующими словами:

to increase, to improve, to perform, to load, to unload

1. The robots ... all processing and working operations.
2. The workers ... product quality due to application of new methods.
3. Automatic devices ... and ... parts on machine tools.
4. NC machines ... productivity by many times.

IV. Выберите правильный вариант:

1. The first semi-automatic machine tools performed ...
a) processing operations b) loading and unloading operations
2. NC machine tools are controlled ...
a) by electronic equipment b) by the workers
3. NC machining centers perform ...
a) several operations b) only one operation

4. Automated factory is ...

- a) a large integrated manufacturing system b) a number of machine tools

5. Industrial robots perform ...

- a) a great number of operations b) auxiliary operations.

V. Ответьте на вопросы, используя следующие выражения:

"Certainly", "I suppose so", "I don't know".

1. Is the introduction of the latest types of machine tools important nowadays?
2. Do the plants produce many NC machine tools, complex machining centers and electronic equipment for automated factories?
3. 3 .NC machine tools represent the first step in application of computers to the control of machine tools, don't they?
4. Are the automated factories large integrated manufacturing system?
5. Specialists in the field of mechanics are trained at the departments in higher technical schools, aren't they?

VI. Прочтите диалог, воспроизведите его:

A. - What are you working at?

B. - You know, the aim of my work is to teach robots "to see" and "to feel" objects.

A. - Oh, I see. But is it possible to achieve it?

B. - Certainly. This is achieved due to semiconductors. You know, they are extremely sensitive.

A. - That's really very interesting. Robotics has made great progress in recent decades, hasn't it?

B. - That's true. Our scientists and engineers are already working on the intelligent robots.

- A. - I have heard that intelligent robots will lead to the total automation in industry.
- B. - Exactly so! And I believe that this task will be solved in the nearest future.
- A. - Thank you for information. I wish you success in your work.

LABORATORY WORK № 1

I. Listen and memorize the new words. Repeat them after the speaker:

science fiction – научная фантастика

to invent the term – придумать термин

environments – окружающая обстановка, среда

hardly – едва

a small tank – небольшой корпус

to save man from – избавить человека от

to be exposed by radiation – подвергаться действию радиации / облучению

nuclear plants – атомные станции

Czech = Czeck – чешский

II. Listen to the text two times:

ROBOTS FROM FANTASY TO REALITY

1. The word "robot" came to science from the science fiction. This term was invented in 1920 by the famous Czech writer Karel Chapek.
2. Since that time robots replace man in industry and in environments that are dangerous for the human health.
3. Robot making became a strategic task of industry for the highly developed states. But the present-day robots hardly resemble the human being. They vary widely in size, configuration and capability.
4. For example, the robot that controls nuclear reactors was built by the New Mexico scientific laboratories. This device resembles a small tank. It has two arms with two fingers at the end. The arm consists of eight joints and is five-meter long. The maximum weight-carrying capacity of the arm is 100 kg. The

computer coordinates the motion of various axes. This robot will be widely used at the nuclear plants and saves man from being exposed to radiation.

III. Answer the questions:

1. What did the word "robot" come from?
2. Who invented the term "robot"?
3. Are the robots widely used nowadays?
4. Where are they widely used nowadays?
5. What is the role of robots in industry of the highly developed countries?
6. How do the present-day robots look like?
7. What robot was invented by the New Mexico scientific laboratories?
8. What are the specifications of this robot?

IV. Reproduce the text using a logical scheme.

1. Robot – was invented in 1920.
2. Robots – replace man in industry-environments dangerous for the human health.
3. Robot-making – strategic task-highly developed states.
4. The present-day robot – hardly resemble-human being.
5. The robot-control nuclear reactors – New Mexico scientific laboratory.
6. Devise – resemble a small tank.
7. Two arms – two fingers – 8 joints – 5 meter long.
8. Weight – carrying capacity – 100 kg.
9. Nuclear plants – saves man – from being exposed to radiation.

LABORATORY WORK № 2

I. Listen to the words and say them after the speaker.

1. versatile – универсальный

2. jointed arm – многозвенная рука
3. screw-driving – завинчивание винтов
4. gluing – склеивание
5. sequence control system – последовательная система управления
6. dialogue mode – диалоговый режим
7. to enter the program – вводить программу
8. to arrange – располагать
9. repeatability – точность позиционирования
10. to fit – подбирать (в качестве элемента системы)

Assembly Robot

1. A new assembly robot is manufactured by Hirata company in Japan.
2. The assembly robot is a flexible, versatile device with a jointed arm and a rotational wrist. Besides assembly operations it performs palletising and depalletising, picking and placing the parts, mounting them on the machine tools, screw-driving, spot welding, gluing and so on.
3. The new assembly robot is a point-to-point device which is programmed with Hirata assembly language. Control is provided by microcomputer-based sequence control system. This control system is based on the dialogue mode and the operator can easily enter the program into the robot memory.
4. Mechanical configuration of this robot is based on the modular system. It possesses from 2 to 4 axes of motion that can be arranged in 5 different combinations.
5. The maximum speed at which the robot arm can move between the points in the work envelope is about 2.4 mm per sec. Repeatability at this speed is 0.05 mm.

6. Well-trained, qualified engineers will select the right robot model for every shop. If the robot is correctly fitted it guarantees the improvement of quality and greater productivity.

II. Answer the questions.

1. What type of robot is manufactured by Hirata company?
2. What operations does it perform?
3. What type of the control system has the assembly robot?
4. How is this robot programmed?
5. What is mechanical configuration based on?
6. When does the robot guarantee the improvement of quality and greater productivity?

III. Listen to the dialogue and reproduce it in pairs.

- A. - I've just listened to the text about a new robot which is designed by Japan robot-making company Hirata.
- B. - As far as I know the Japanese robots are well-known for its precision and quality. What kind of robot is this?
- A. - This is an assembly robot. Besides, it performs such operations as palletising and depalletising, picking and placing the parts, mounting them on the machine tools, screw-driving, spot welding, gluing and so on.
- B. - To my mind that is a versatile robot. What type of control has it?
- A. - It's a point-to-point device which is based on micro-computer sequence control system.
- B. - Is this robot difficult to program?
- A. - Oh, no. It is programmed with a Hirata Assembly Language. As it operates in a dialogue mode, the operator can easily enter the program into computer memory.

B. - Can you tell me what the work envelope characteristics are?

A. - This robot has from 2 to 4 axes of motions which can be arranged in 5 different combinations. The maximum speed of the robot arm is 2.4 mm per sec. Repeatability is 0.05 mm.

B. - Thank you for the interesting information.

A. - I say, what about going to the library together to look through the magazines on robots.

B. - With great pleasure. I am very much interested in new types of robots, as I am writing the term paper.

LABORATORY WORK № 3

I. Listen to the new words and say them after speaker:

the latest robot recruit – последняя новинка в классе роботов

creature – создание

foreign bodies – инородные тела

sub-standard candidates – нестандартная продукция

rivers of beans or nuts – потоки фасоли или орехов

potato flakes – картофельные хлопья

rejects – брак

tiny peanuts – мелкий арахис

fried potato flakes – жареные картофельные хлопья

tedious work – утомительная работа

maggot hole – отверстие, сделанное червяком

intelligent needles – чувствительные щупы

to cast out – выбросить

fatigue – утомление

eye strain – напряжение зрения

Robot Zaan sorts the rejects.

1. The latest robot recruit to British industry was shown to the public in London.
2. The creature's name is Zaan, and its talent is for sorting out small objects by their colour. In particular, it is designed for the food industry to pick out foreign bodies and sub-standard candidates from rivers of beans or nuts or potato flakes. It can separate rejects at the rate of 200 rejects a second.
3. This sort of work has been done in the past by four or five men sitting alongside a conveyor belt picking out tiny peanuts or bad fried potato flakes from satisfactory ones. Men can pick out rejects at a rate of about one a second; it is tedious work. It costs £50 a ton to sort dehydrated food flakes by hand.
4. There are machines which can sort small objects by size and shape, for instance rejecting a bean with a maggot hole which is detected by intelligent needles. But the Zaan Colour Sorter inspects the small particles with photo-electric eyes and casts out any which are the wrong colour or wrong brightness.
5. Unlike human sorters, the machine is unaffected by emotional problems, fatigue, eye-strain, the tea-break, or the conversation next door.
6. The inventors claim that it is cheaper, more hygienic, and more accurate than traditional methods of sorting.

II. Answer the questions to the text.

1. What functions does the robot Zaan perform?
2. What industry is Zaan designed for?
3. In what way was the sorting performed earlier?

4. What are the advantages of the robotized sorting?
5. What can help to find maggot holes in the beans?

III. Listen to, the dialogue and reproduce it in pairs.

A. - Hello, Lena! Haven't seen you for ages! Where have you been?

B. - Hello, Oleg! Our group was working in the collective farm. We were sorting potato. The crop was very rich and it took us long to stay there

A. - Why haven't you use any technical means?

B. - There was a sorting machine, but it was out of order all the time.

A. - But you are a future engineer! Why didn't you use any technical innovations and improvements?

B. - Do you mean we should use a robot which detects rejects by intelligent needles or photo-electric eyes?

A. - Yes, of course. This robot replaces four or five men sitting alongside conveyor belt, doing very tedious work.

B. - Yes, of course. The robot has many advantages. It is unaffected by emotional problems, fatigue, eye-strain, tea-breaks and conversation next door. But there are only laboratory models of such robots and it's a long time when they will be widely used in our everyday life.

LABORATORY WORK № 4

The RM-101 Movemaster.

1. Now Mitsubishi Electric Co. of Tokyo, Japan is pioneering a new robotics category: the desktop robot – the RM-101 Movemaster.
2. The Movemaster is an industrial robot in miniature. 10-inch-high robot works and is operated in the same way as a large industrial robot.

3. The RM-101 Movemaster works in conjunction with a personal computer.
4. It responds to commands given in the most common computer languages.
5. It revolves on its base and has a jointed "arm" that moves in six other axes.
6. Three "hands" can be attached to its business end.
7. The "hands" can perform a variety of "pick-up" and "put-down" functions (operation).
8. It can easily pick up a telephone, a pencil and paper clips.
9. Mitsubishi is selling the micro-robot to schools and businesses as a training aid.
- 9a. It can become the desktop toy for executives at least if they are high-paid ones.

I. Listen to the new words and say them after speaker:

Is pioneering – первыми производят

Desktop – настольный

Works in conjunction with – подсоединён к

To respond to – отвечать на

The most common – самые обычные

Inch = 2,54 см – дюйм

Pound = 453,6 г – фунт

Is operated – управляется

In the same way – таким же образом

To revolve on – вращаться вокруг

Joint – шарнир

Jointed "arm" – шарнирная "рука"

To move – двигаться

Axes – оси

Axis – ось

To move in six other axes – двигаться ещё по шести осям

"Hand" – кисть

To attach to – прикреплять

Its business end – его рабочая часть

To perform – выполнять

A variety of functions – ряд функций

To pick-up – захватить (и поднять)

To put-down – опустить

Businesses – компании

Training aid – учебная модель

Paper clips – отрезки бумаги

To become – становиться

Desktop toy – настольная игрушка

Executives – высшее звено служащих

At least – по крайней мере

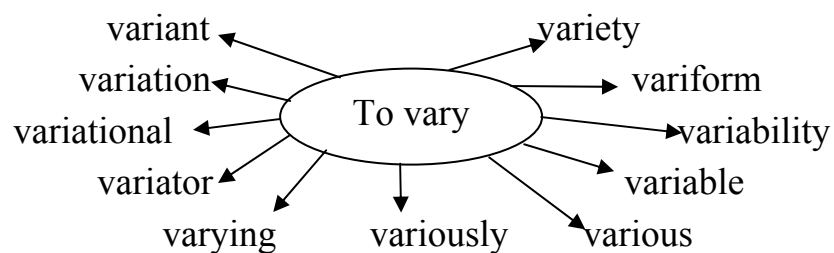
High-paid ones – высокооплачиваемые (служащие)

II. Make up word combinations:

- | | |
|----------------------|--|
| 1. to pioneer | a. a pencil |
| 2. to work in | b. schools and businesses |
| 3. to respond to | c. conjunction with a personal computer |
| 4. to be operated in | d. the same way as a large industrial robot |
| 5. to revolve on | e. six other axes |
| 6. to move in | f. a variety of "pick-up" and "put-down" functions |
| 7. to be attached to | j. a new robotics category |
| 8. to perform | h. the desktop toy for executives |

- | | |
|----------------|---|
| 9. to sell to | i. commands given in the most common computer languages |
| 10. to pick up | g. its base |
| 11. to become | k. a business end |

III. Study the scheme of related words:



IV. Study the functions of the RM-101 Movemaster. What other functions can be added?

The RM-1 functions.

1. responds to commands (given in the most common computer languages).
2. revolves on its base.
3. moves in six other axes.
4. performs a variety of "pick-up" and "put-down" functions.
5. picks up a pencil, a telephone, paper clips.

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