**Практическая работа № 30**

***Прочитайте текст и выполните задания после текста.***

**TYPES OF AUTOMATION**

**Applications of Automation and Robotics in Industry**

Manufacturing is one of the most important application area for automation technology. There are several types of automation in manufacturing. The examples of automated systems used in manufacturing are described below.

Fixed automation, sometimes called «hard automation» refers to automated machines in which the **equipment** configuration allows fixed **sequence** of processing operations. These machines are programmed by their design to make only certain processing operations. They are not easily changed over from one product style to another. This form of automation needs high initial investments and high production rates. That is why it is suitable for products that are made in large volumes. Examples of fixed automation are machining transfer lines found in the automobile industry, automatic **assembly machines** and certain chemical processes.

Programmable automation is a form of automation for producing products in large **quantities,** ranging from several dozen to several thousand units at a time. For each new product the production equipment must be reprogrammed and changed over. This reprogramming and changeover take a period of **non-productive** time.

Production rates in programmable automation are generally lower than in fixed automation, because the equipment is designed to **facilitate** product **changeover** rather than for product specialization. A numerical-control machine-tool is a good example of programmable automation. The program is coded in computer memory for each different product style and the machine-tool is controlled by the computer program.

Flexible automation is a kind of programmable automation. Programmable automation requires time to reprogram and change over the production equipment for each series of new product. This is lost production time, which is expensive. In flexible automation the number of products is limited so that the changeover of the equipment can be done very quickly and automatically. The reprogramming of the equipment in flexible automation is done at a computer terminal without using the production equipment itself. Flexible automation allows a mixture of

different products to be produced one right after another.

**Vocabulary**

**equipment** — оборудование

**sequence** — последовательность

**initial** — первоначальный, начальный

**investment** — инвестиция, вклад

**to facilitate** — способствовать

**rate** — скорость, темп

**assembly machines** — сборочные машины

**quantity** — количество

**non-productive** — непроизводительный

**changeover** — переход, переналадка

**Задание 1. Ответьте на вопросы**

1. What is the most important application of automation?
2. What are the types of automation used in manufacturing?
3. What is fixed automation?
4. What are the limitations of hard automation?
5. What is the best example of programmable automation?
6. What are the limitations of programmable automation?
7. What are the advantages of flexible automation?
8. Is it possible to produce different products one after another using automation technology?

**Задание 2. Найдите в тексте перевод следующих словосочетаний и запишите их.**

1. сфера применения
2. фиксированная последовательность операций
3. автоматические сборочные машины
4. определенные химические процессы
5. станок с числовым программным управлением
6. потерянное производственное время
7. разнообразная продукция

**Задание 3. Переведите письменно.**

1. As long as you are working here, we'll have а rest.

2. I'll have а talk with you after I've done my work.

3. They'll come before the dinner starts.

4. The students had been doing translation since the lesson began.

5. What were you doing when I came in?

6. I gave the books to her after I had read them.

7. The porter dropped the box as he was bringing it in.

8. How they managed to do it was not clear.

9. Whether the students can do this work is the main problem.

10. That they have known about the plan seems evident.

11. To be or not to be that is the question.

12. As soon as I find your things, I'll let you know.

13. As soon as I finished work, I went home.

14. We had already reached the village when it began raining.

15. They went for а walk after they had finished the work.

**Практическая работа № 31**

***Посмотрите на картинку и прочитайте инструкции. Выполните задания после текста.***



**PENDANT KEYBOARD**

The keyboard is broken up into eight sections: Function Keys, Jog Keys, Override Keys, Display Keys, Cursor Keys, Alpha Keys, Mode Keys and Number Keys. In addition there are miscellaneous keys and features located on the pendant and keyboard.

**Power On**- Turns the machine on.

**Power Off**- Turns the machine off.

**Spindle Load Meter** - Displays the spindle load, in percent.

**Emergency Stop** - This stops all axes motion, stops the spindle, turret, and turns off the coolant pump.

**Jog Handle** - This is used to jog all axes. It can also be used to scroll through program code or menu items while editing.

**Cycle Start** - Starts a program. This button is also used to start a program in Graphics mode.

**Feed Hold** - Will stop all axis motion. Note: Spindle will continue to turn during cutting.

**Reset** - Will stop the machine (axes, spindle, coolant pump, and turret are stopped). This is **not** a recommended method to stop the machine, as it may be difficult to continue from that point.

**Power Up/Restart** - When this key is pressed, the axes will return to the machine zero position and a tool change may occur. See Setting 81 in the Settings chapter for more information. This will not work for toolroom lathes, subspindle lathes, or automatic parts loader (APL).

**Auto Off** - Automatically positions axes to machine zero and prepares the machine for power down.

**Memory Lock Key Switch** - This switch prevent the operator from editing programs and from altering settings when turned to the locked position.

**Work Light Switch** - This switch will turn on the work light inside of the machine.

**Keyboard Beeper** - Located at the top of the parts tray. The volume can be adjusted by turning the cover.

**Задание 1. Ответьте на вопросы, используя инструкцию выше.**

1. How many sections does the keyboard have? What are they?
2. What key turns the machine on?
3. What is the function of the key «Power Off**»?**
4. What key displays the spindle load?
5. What is «Jog Handle» for?
6. What button stops all axis motion?
7. When will the axes return to the machine zero position?
8. What key automatically positions axes to machine zero and prepares the machine for power down?
9. What does the switch «Memory Lock Key Switch» prevent the operator from?
10. What switch will turn on the light inside of the machine?
11. How can the volume be adjusted?

**Грамматика**

**Задание 2. Переведите предложения на русский язык, обращая внимание на перевод «Сложного дополнения» (См. таблицу ниже)**

1. They expected us to have found the answer to the question.
2. You must make him explain the results obtained
3. We consider Mendeleev to be a great Russian scientist.
4. We consider Tsiolkovsky to be the father of astronautics
5. I heard the experiment to be finished by them last month.
6. This force causes the objects to change direction.

**Сложное дополнение**

В английском языке сложные члены предложения с инфинитивом переводятся на русский язык, как правило, придаточными предложениями.

Свое мнение, суждение, предположение о каком-либо лице, факте или предмете говорящий на английском языке может выразить двумя способами:

1. Сложноподчиненным предложением с придаточным предложением дополнения.

*Например*: I believe that this value changes.

2. Простым предложением со сложным дополнением, которое состоит из существительного (в общем падеже) или местоимения (в объектном падеже) и инфинитива.

*Например*: I believe this value to change. - Я полагаю, что это значение меняется.

На русский язык сложное дополнение с инфинитивом переводится сложноподчиненным предложением с придаточным дополнительным предложением:

Сложное дополнение с инфинитивом может употребляться после глаголов, выражающих:

1) мнение, суждение, предположение: **to think, to consider, to believe, to suppose,**

**to expect (ожидать), to know, to assume, to prove, to doubt и др.**

*Например*: We consider heat to be a form of energy. — Мы считаем, что тепло является формой энергии.

2) чувства и волеизъявления: **to wish, to want и др**.

*Например*: I wish you to come again. — Я хочу, чтобы вы пришли снова.

3) физическое восприятие и ощущения: **to see, to hear, to feel и др**.; после этих глаголов инфинитив употребляется **БЕЗ «TO»**.

*Например*: I heard somebody speak in the next room. Я слышал, как кто-то разговаривал в соседней комнате.

We observe the direction constantly change. Мы наблюдаем, что направление непрерывно меняется.

4) приказание: **to make, to cause в значении «заставлять»**; после этих глаголов инфинитив употребляется **БЕЗ «TO»**.

*Например*: You must make them check the results carefully. Вы должны заставить их тщательно проверить результаты.

Gravity causes bodies to fall to the earth. Гравитация заставляет тела падать на землю.

**Практическая работа № 32**

***Прочитайте текст и выполните задания после него.***

**SAFETY ENGINEERING**

Accidents to people in industrial enterprises are called industrial injury. They occur when workers have not acquired the requisite for skill and lack the necessary experience in handling tools and equipment. Accidents are also caused through neglect of safety rules and regulations in the factories and training workshops.

The purpose of safety engineering is to prevent accidents and to create such conditions of work in industry which will ensure maximum productivity of labour.

When taking up new duties or when first going to work at any industrial enterprise each worker is obliged to acquaint him thoroughly with, and to master the safety instructions.

**Задание 1. Ответьте на вопросы к тексту**

1. How are the accidents to people in industrial enterprises called?
2. When do the accidents to people occur?
3. What must one do to prevent accidents?
4. What is the purpose of safety engineering?
5. What is a worker obliged to do when taking up new duties?

**Задание 2. Прочитайте текст и переведите письменно 1 и 2 абзацы.**

**Задание 3. Найдите соответствия английских и русских предложений**

|  |  |
| --- | --- |
| **a)**   1. Wear safety boots! 2. Don’t enter! 3. Don’t use a mobile phone here. 4. Emergency exit this way! 5. Be careful. Dangerous liquid! 6. Don’t touch! 7. Wear safety goggles in the area! 8. Don’t park here! 9. Be careful! Explosive material! 10. Don’t switch on! 11. Danger of an electric shock! 12. Don’t smoke here! 13. Wear a hard hat! 14. Watch out! Danger! | **b)**  a) Руками не трогать!  b) Парковка запрещена!  c) Осторожно! Взрывоопасные вещества. d) Не курить!  e) Не включать!  f) Осторожно! Высокое напряжение! g) Надеть обувь!  h) Запасной выход!  i) Осторожно! Опасно!  j) Отключить мобильные телефоны!  k) Не входить!  l) Для безопасности оденьте очки!  m) Осторожно! Опасные растворы! n) Надеть каску! |

**Задание 4. Заполните пропуски словами, данными справа**

|  |  |
| --- | --- |
| 1) These ear protectors must be carried everywhere in the 1\_\_\_\_\_\_\_ hangar. 2) These 2\_\_\_\_\_\_\_ must be lubricated every day. 3) Drivers are required to check the 3\_\_\_\_\_\_\_, lights, tyres, and water before a long car journey. 4) Apprentices must always wear 4\_\_\_\_\_\_\_ in the workshop. | a) overalls  b) gears  c) brakes  d) aircrafts |

**Задание 5. Переведите предложения, обращая внимание на перевод «Сложного подлежащего» (См. таблицу ниже).**

1. Light is proved to travel in straight lines.
2. Popov is known to be the inventor of radio in Russia.
3. Faraday is believed to be a great English physicist.
4. He is believed to be a very talented person.
5. Forging processes are expected to be performed at various temperatures.
6. This device is sure to have changed the world.

**Сложное подлежащее**

В состав Сложного подлежащего входит имя существительное (в общем падеже) или местоимение (в именительном падеже) и инфинитив. Все предложение имеет следующую структуру:

The value is said to change. – Говорят, что это значение меняется.

Не is expected to come. - Ожидают, что он придет.

т. е. между существительным и инфинитивом стоит сказуемое предложения, выражающее мнение, суждение или предположение.

Мнение, суждение, предположение в таком предложении может быть выражено следующими глаголами:

1) в страдательном залоге:

|  |  |  |  |
| --- | --- | --- | --- |
| This value | is expected  is assumed  is reported  is considered  is proved  is found  etc. | to change  (to be changing)  (to have changed) | Известно, …  Предполагают,  Ожидают, …  Допускают,…  Сообщают,…  Считают, …  Доказано, …  Найдено, и т. д. |

2) в действительном залоге:

|  |  |  |  |
| --- | --- | --- | --- |
| This value | seems  appears  turns out  proves  is likely  is unlikely  is sure  is certain | to change  (to be changing)  (to have changed) | По-видимому …  Оказывается…  ““  “”  Вероятно …  Маловероятно …  Безусловно …  Непременно… |

Перевод английского предложения следует начинать со сказуемого предложения и переводить его неопределенно-личным предложением «Известно …», «Находят …», «Считают …» и т. д., за которым следует придаточное предложение с союзом **что**.

This device appears to be of some interest. - По-видимому, этот прибор представляет интерес.

It is supposed to be used in our experiment. - Предполагается, что он будет использован в нашем эксперименте

**Практическая работа № 33**

**Прочитайте текст и выполните задание.**

The family-run WEILER Group took over Kunzmann Maschinenbau GmbH almost exactly two years ago. First founded over a hundred years ago, the manufacturer of universal, milling and drilling machines and machining centers has continued to operate as an independent company and has also maintained all existing jobs. The company is clearly set for the future in terms of technology, too - as demonstrated by the newly launched BA 1100 vertical machining center.

This is a modern vertical machining centre for universal use in the series production of small to medium-sized batches.

Highly versatile and easy to use, the latest Kunzmann innovation delivers a generous work area despite its surprisingly compact dimensions. As its name suggests, the BA 1100 supports a travel distance of 1,100 millimeters on the x-axis and 650 millimeters on the z-axis. At 750 millimeters, the y-axis offers the greatest flexibility available so far for machining centers in the 1000 class. Thanks to its modular design, the different variations of the BA 1100 can easily be adjusted to specific production requirements. For instance, three main spindle variants are available with a maximum speed of 10,000, 14,000 or 18,000 revolutions per minute, and with SK 40 / HSK 63 tool fixtures. The standard model includes a 38-way tool changer, while a 60-way changer is also optionally available.

**Задание 1. Ответьте на вопросы:**

1. What is the manufacture of the BA 1100? What country is it from?
2. What kind of machines do they produce?
3. What kind of tool is the BA 1100?
4. What is the purpose of this machine?
5. What travel distances does it support?
6. What distance does it have on the y-axis?
7. Why can the BA1100 be easily adjusted to specific production requirements?
8. How many variants of spindle and speeds are available?
9. What kind of tool changers are presented?

Задание 2. Переведите письменно технические характеристики центра. Unique features of KUNZMANN machining centres:

Design

* FEM-optimised cast iron construction in cross table design, with C-frame holding the vertical spindle and tool changer.
* The BA 1100 comes with a unique space concept that includes extra-large travel ranges, in particular along the Y-axis (750 mm) and the Z-axis (up to 900 mm). Ideal for the machining of cube-shaped workpieces.
* Linear roller profile guideways in X-, Y- and Z-axis for dynamic axis repositioning.
* Large ball-type linear drives, 40 mm X-, Y- and Z-axis, guarantee optimum stability.
* The pneumatic weight compensation in the Z-axis supports the ball-type linear drive and ensures additional dynamics as well as optimised surface finish.
* As the machine is available with a range of spindle versions, it can be easily adapted for various machining tasks.
* The large, quick tool changer (38 or 60 pockets) allows for efficient production with minimum disruption.
* All BA 1100 models come with a slat band chip conveyor and adjustable chip bath rinsing.
* Machining accuracy
* Polished ball-type linear drives in all axes for exceptionally high positioning and reproduction accuracy.
* Constant spindle temperature thanks to spindle cooling system that is included as standard.
* Direct incremental linear measuring system protected by sealing air in all axes for high-precision production (optional).

Ergonomic design

* Easy access to working area through large front doors.
* Machine table at optimised working height (approx. 1.000 mm). The table can be moved to the front of the booth to bring the clamping table and workpiece as close as possible to the operator.
* The movable operating panel and the electronic hand wheel facilitate setup and retooling of the machine.
* The smooth internal walls and adjustable chip bath rinsing make the machine easy to clean and guarantee efficient chip removal.
* The overall design of the machine with lateral booth maintenance doors facilitates maintenance.

Technical Data BA 1100 L/H

Working range

|  |  |  |
| --- | --- | --- |
| X-axis (longitudinal) | mm | 1.100 |
| Y-axis (cross) | mm | 750 |
| Z-axis (vertical) BA 1100 L BA 1100 H | mm mm | 650 900 |
| Main spindle drive | kW | (100% DC) 10,0 (40% DC) 14,0 |
| Spindle speed range | rpm | 10.000/14.000/18.000 |
| Tool taper |  | SK 40/HSK 63 |
| Feed rate | m/min | 30/30/30 |
| Rapid traverse | m/min | 30/30/30 |
| Contouring control |  | TNC 640 840 D sl ShopMill |
| Weight | kg | approx. 8.900 |
| Clamping table | mm | 1.350 x 700 |
| T-slots |  | 6 x 18 H 8 |
| Loading ability | kg | max. 1.500 |
| Tool changer |  |  |
| Number of tool positions |  | 38/60 |
| Tool change time | sec | approx. 3 |
| Chip-to-chip-time | sec | approx. 8 |
| Coolant supply through spindle | bar | 25/40 |

**Практическая работа № 34**

***Прочитайте текст и выполните задания***

**Drawing types and scales**

In engineering, most design information is shown on drawings. Today, drawings are generally not drawn by hand. They are produced on computer, using CAD (computer-aided design) systems.

**A key factor on a drawing is the scale - that is, the size of items on the drawing in relation to their real size. When all the items on a drawing are shown relative to their real size, the drawing is drawn to scale, and can be called a scale drawing. An example of a scale is 1:10 (one to ten). At 1:10, an object with a length of 100 mm in real life would measure 10 mm on the drawing.**

**Most engineering designs consist of a set of drawings (a number of related drawings):**

* + - **General arrangement (GA) drawings show whole devices or structures, using a small scale. This means objects on the drawing are small, relative to their real size (for example, a 1:100 drawing of an entire building).**
    - **Detail drawings show parts in detail, using a large scale, such as 1:5 or 1:2. Small parts are sometimes shown in a detail as actual size (1:1), or can be enlarged to bigger than**

**actual size (for example, 2:1).**

**For electrical circuits, and pipe and duct networks, it is helpful to show designs in a simplified form. In this case, schematic drawings (often referred to as schematics) are used.**

An everyday example is the map of a train network.

In non-technical, everyday English, engineering drawings are often called plans.

Section is the short form of cross-section, and is commonly used in technical contexts.

Two-dimensional and three-dimensional are often shortened to 2D and 3D.

**Задание 1. Переведите письменно на русский язык выделенные предложения.**

**Задание 2. Закончите предложения, используя текст.**

1. Enlarged drawings show components larger than their...................................
2. For engineering drawings, 1:5 is a commonly used................................
3. Whole machines or structures are shown on ........................................ drawings.
4. Electrical drawings don't usually show sizes. They're shown as..............................
5. A ..........................of drawings for a large project can consist of hundreds of pages.
6. Most drawings are produced on computers, using................................software.

**Задание 3. Найдите соответствия между определением в первой колонке**

|  |  |  |
| --- | --- | --- |
| 1. a 2D view of the side of an object |  | a a plan |
| 1. a 2D view inside an object, as if it is cut through |  | b a section |
| 1. a 2D view, looking down on top of an object |  | c an isometric projection |
| 1. a 3D view, showing an assembly taken to pieces |  | d an oblique projection |
| 1. a 3D view, with the 2D face of the object at the front |  | e an exploded view |
| 1. a 3D view, with a corner of the object at the front |  | f an elevation |