**Практическая работа № 28**

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

**COMPUTER SCIENCE IN ENGINEERING**

Computer science is a part of an applied mathematics. Specialists in computer science say that this field of knowledge is very interesting because it deals with computer-aided-design (CAD) and computer-aided-manufacturing (CAM).

Computers are intended to improve the productivity of labour of scientists, designers, engineers, managers, and other specialists, because computers offer quick and optimal solutions. One of the main goals of using CAD/CAM is to shorten the time between designing and manufacturing.

Computer aided design (CAD) is the process of creating a design, known as drafting, using computer technology. Computer aided manufacturing (CAM) is the use of computers and computer software to guide machines to manufacture something, usually a part that is mass-produced. There is always a strict relation between CAD and CAM and they are often used together.

CAD creates the design and CAM builds it. CAM is usually dependent on CAD. The use of CAD created designs offers an easy way of inputting information into a CAM software system. CAM and CAD are both referred to as part of an overall process known collectively as computer aided engineering (CAE). They can render things in either two dimensions (2D) or three dimensions (3D).

Many CAM machines have CAD software built-in, although not all designs require the use of a CAD created design. A CAD user will typically be an engineer with training in CAD software, whereas a CAM user will usually be a specially trained machinist. These types of machinists are highly skilled.

**Задание 1. Ответьте на вопросы, используя текст.**

1. What do the abbreviations CAM and CAD mean?
2. What is one of the main goals of using CAM and CAD?
3. What is CAD?
4. What is CAM
5. Are they used together? How?
6. What is CAE?
7. What can you say about a CAD and CAM users?

**Задание 2. Переведите на русский язык в письменной форме абзацы 2, 3, и 5.**

**Задание 3. Заполните пропуски в предложениях.**

1. The use of CAD created … offers an easy way of … information into a CAM software system.
2. CAM is the use of computers and computer software to … machines to manufacture something, usually a … that is mass-produced.
3. A lot of CAM ... have CAD software ..., although not all designs ... the use of a CAD created design.
4. Computers are … to improve the productivity of labour of scientists, designers, engineers, managers, and other specialists, because computers … quick and optimal …**.**

**Практическая работа № 29**

**Прочитайте текст и выполните задания после него**

**ROBOTS IN MANUFACTURING**

Today most robots are used in manufacturing operations. The applications of robots can be divided into three categories:

1. material handling

2. processing operations

3. assembly and inspection.

Material-handling is the transfer of material and loading and unloading of machines. Material-transfer applications require the robot to move materials or work parts from one to another. Many of these tasks are relatively simple: robots pick up parts from one conveyor and place them on another. Other transfer operations are more complex, such as placing parts in an arrangement that can be calculated by the robot. Machine loading and unloading operations utilize a robot to load and unload parts. This requires the robot to be equipped with a gripper

that can grasp parts. Usually the gripper must be designed specifically for the particular part geometry.

In robotic processing operations, the robot manipulates a tool to perform a process on the work part. Examples of such applications include spot welding, continuous arc welding and spray painting. Spot welding of automobile bodies is one of the most common applications of industrial robots. The robot positions a spot welder against the automobile panels and frames to join them. Arc welding is a continuous process in which robot moves the welding rod along the welding seam. Spray painting is the manipulation of a spray-painting gun over the surface of the object to be coated. Other operations in this category include grinding and polishing in which a rotating spindle serves as the robot's tool.

The third application area of industrial robots is assembly and inspection. The use of robots in assembly is expected to increase because of the high cost of manual labour. But the design of the product is an important aspect of robotic assembly. Assembly methods that are satisfactory for humans are not always suitable for robots. Screws and nuts are widely used for fastening in manual assembly, but the same operations are extremely difficult for an one-armed robot.

Inspection is another area of factory operations in which the utilization of robots is growing. In a typical inspection job, the robot positions a sensor with respect to the work part and determines whether the part answers the quality specifications. In nearly all industrial robotic applications, the robot provides a substitute for human labour. There are certain characteristics of industrial jobs performed by humans that can be done by robots:

1. the operation is repetitive, involving the same basic work motions every cycle,

2. the operation is hazardous or uncomfortable for the human worker (for example: spray painting, spot welding, arc welding, and certain machine loading and unloading tasks),

3. the workpiece or tool is too heavy and difficult to handle,

4. the operation allows the robot to be used on two or three shifts.

**Vocabulary:**

handling — обращение

spray painting — окраска распылением

transfer — передача, перенос

frame — рама

location — местонахождение

spray-painting gun — распылитель краски

pick up — брать, подбирать

grinding — шлифование

arrangement — расположение

polishing — полирование

to utilize — утилизировать, находить применение

spindle — шпиндель

gripper — захват

manual — ручной

to grasp — схватывать

labour — труд

spot welding — точечная сварка

hazardous — опасный

shift — смена

continuous — непрерывный

arc welding — электродуговая сварка

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

1. How are robots used in manufacturing?

2. What is «material handling»?

3. What does a robot need to be equipped with to do loading and unloading operations?

4. What does robot manipulate in robotic processing operation?

5. What is the most common application of robots in automobile manufacturing?

6. What operations could be done by robot in car manufacturing industry?

7. What are the main reasons to use robots in production?

8. How can robots inspect the quality of production?

9. What operations could be done by robots in hazardous or uncomfortable for the human workers conditions?

**Задание 2. Переведите на английский язык предложения из текста:**

1. Существует несколько различных сфер использования автоматизации в производстве.

2. Для использования жесткой автоматизации необходимы большие инвестиции.

3. Жесткая автоматизация широко используется в химической промышленности.

4. Станки с числовым программным управлением — хороший пример программируемой

автоматизации.

5. Гибкая автоматизация делает возможным перепрограммирование оборудования.

6. Время простоя оборудования оборачивается большими убытками.

7. Использование гибкой автоматизации делает возможным производство разнообразной продукции.

**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 areas 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**

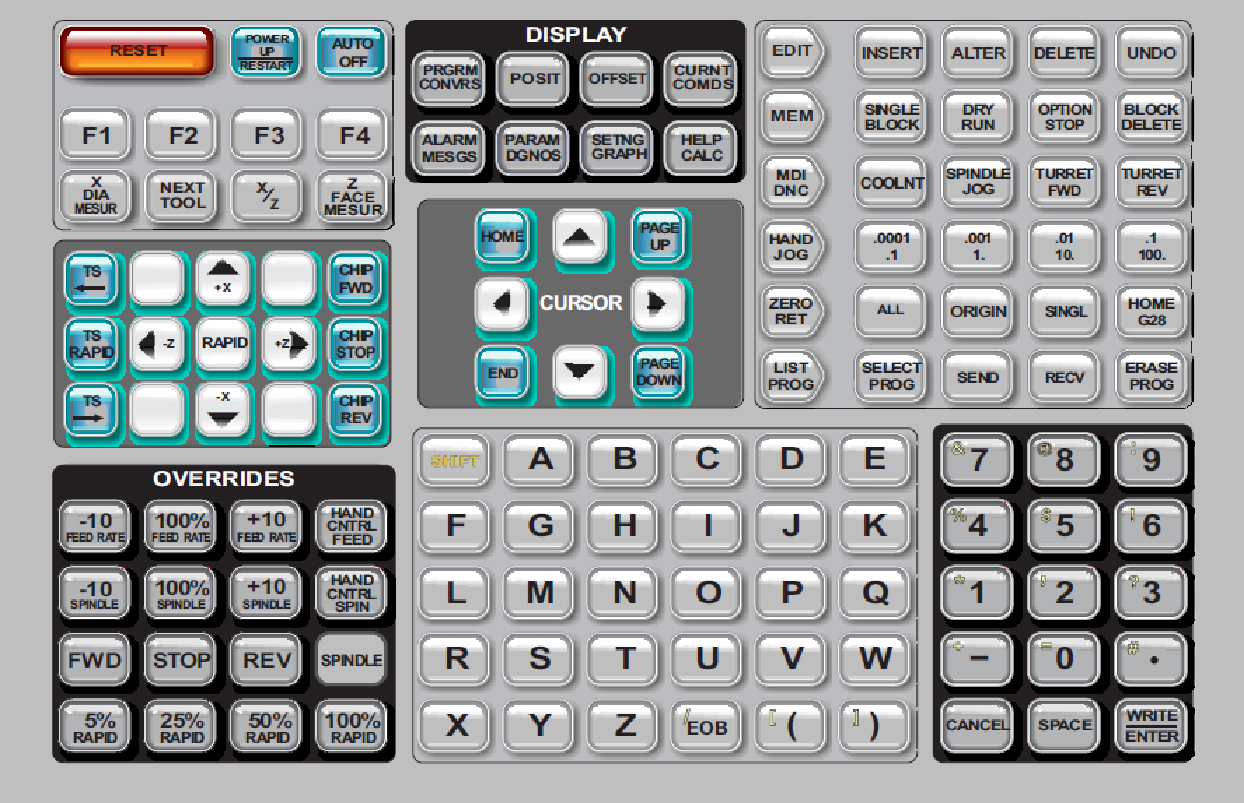
1. What is the most important application of automation?
2. What are the types of automation used in manufacturing?
3. What is fixed automation?
4. What are the limitations of hard automation?
5. What is the best example of programmable automation?
6. What are the limitations of programmable automation?
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

**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 prevents 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.

|  |
| --- |
| 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 и переведите текст письменно.**

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

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| --- | --- |
| 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.

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| --- |
| **Сложное подлежащее**   1. В состав Сложного подлежащего входит имя существительное (в общем падеже) или местоимение (в именительном падеже) и инфинитив. Все предложение имеет следующую структуру: 2. The value is said to change. – Говорят, что это значение меняется. 3. Не is expected to come. - Ожидают, что он придет. 4. т. е. между существительным и инфинитивом стоит сказуемое предложения, выражающее мнение, суждение или предположение. 5. Мнение, суждение, предположение в таком предложении может быть выражено следующими глаголами:    1. в страдательном залоге:    2. в действительном залоге:   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 № 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 (1-6) с терминами во второй (a-f).**

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