

Test 1 STT III

Define the term Rapid prototyping

These are all technologies that automate the process for producing 3-dimensional, solid objects from original materials.

A group of technologies that enable the production of models and prototypes of complicated parts directly from 3D CAD data. Objects can be made of different equipment-dependent materials.

We divide according to the RP production process

Layers added using a laser

With curing point by point

With layer curing

Layers added without laser

With curing point by point

With layer curing

Principle of Stereolithography

The 3D PC model is converted to the desired format

Loading data into RP software

Creation of virtual model and its cutting and setting of layer thickness

Proposals for aid

Define the concept of 3D printing

3D printing includes those technologies that use the layer-by-layer approach to create powder layers and then selectively bond to a solid body. ”

It is a process similar to Laser Sintering except that the blasting of the binder binds powder

3D printing uses inkjet heads to apply

Define pig iron and slag

The slag protects the surface of the molten iron from oxidation. The discharge (so-called tapping) of pig iron and slag from the bottom of the blast furnace is carried out every two hours.

Pig iron contains impurities: about 4% C, mainly Mn, Si, P, S. It is very hard but brittle. It is cast into moulds (cast iron) and is used to produce heating elements, machine parts, pipes, etc., but most of them are further converted to steel.

Explain the need and method of marking steel

Steel marking is prescribed by the standard. Individual pipes or sheets are marked with a color mark during manufacture.

In addition to color coding, numerical coding is used. The steel code number consists of the basic code number - five or six digits. This symbol may be supplemented by an additional digit symbol - a two-digit symbol separated by a period from the base symbol.

Steel sign for forming 1x xxx or 1x xxx.xx

Steel symbol for casting 42 xxxx or 42 xxxx.xx

Define the term malleable cast iron

It is produced by annealing - long-term annealing of white cast iron, during which the structure called cementite decomposes into iron and graphite.

Tempered graphite, which has the shape of irregular grains, is eliminated. Its presence affects the properties of malleable cast iron similarly to spheroidal graphite in ductile iron

In some cases, cast iron has a greater shrinkage and deterioration of the casting capacity, making it unsuitable for the production of large castings (up to 100kg).

How do we classify non-ferrous metals?

heavy non-ferrous metals and their alloys (density over 5kg / dm³),

light non-ferrous metals and their alloys (density up to 5kg / dm³).

What are the heavy non-ferrous metals?

lead,

nickel,

antimony,

tin,

zinc,

cadmium,

What do we classify as light non-ferrous metals?

aluminum - Al and alloys

titanium - Ti and alloys

magnesium - Mg and alloys

Define Solders and their basic subdivisions

Solders are non-ferrous metal alloys used as a filler material in brazing.

According to the melting temperature we divide soldering and soldering.

Solders with a melting point of up to 500 ° C are soft solders.

Solders with a melting point above 500 ° C up to about 950 ° C are hard solders

Test 2 STT III

Define the term powder metallurgy

Powder metallurgy makes it possible to obtain products with special properties (eg heat resistance, abrasion resistance, etc.).

Products with high porosity and products forming a transition to composites that cannot be produced by other technologies.

Powder metallurgy involves both the production of powders and their compaction (usually by pressing and sintering) into construction materials or components.

Briefly state the production process of powder metallurgy technology

production of powders

treatment of powders

pressing of powders

sintering, or sintering, of powdered parts

product finishing.

Define the term sintering

Sintering is a method of heat treating a compacted particle or powder compact in which the porous compact becomes a continuous body under the influence of temperature and possibly pressure.

The total particle contact area increases, porosity decreases, physical and mechanical properties increase, and volume shrinkage occurs.

The sintering temperature is chosen between 0.6 and 0.9 melting point.

The sintering can take place under normal pressure or under the pressure of external forces. The sintering is carried out in electric furnaces with a protective atmosphere of reducing or inert gases or vacuum.

The most important parameters of sintering are temperature, sintering time and environment.

Describe the concept of anti-float sting

It is applied in case of supercritical hydrogen content in steel, where there is a tendency to form internal cracks - flakes. critical value. Annealing should be carried out immediately after casting or thermoforming (before cooling to ambient temperature), when the hydrogen present does not yet produce molecules that are no longer capable of diffusion and therefore displacement from steel. After prolonged holding at the annealing temperature, it is advisable to cool very slowly up to at least 500 ° C.

Describe the term Tempering

Tempering is a method of heat treatment of steels, which usually follows immediately after quenching. By heating the hardened steel to temperatures not exceeding AC1, martensite is decomposed and residual austenite is converted. Changes in structure and resulting changes in mechanical properties depend primarily on the level of the passage temperature

Describe the technology of editing and write what technologies we include here

Cutting is the most widespread forming operation.

It is used for:

preparation of semi-finished products (cutting of sheets or coils of sheets, cutting of profiles, rolled metal, etc.)

cutting of sheet metal parts either for end use or for products for other technologies (bending, extrusion, drawing, etc.)

finishing and / or auxiliary operations.

Includes:

punching,

cutting out,

trimming,

trimming, etc.

Explain 3 phases of cutting

In the first stage, there is an area of elastic deformation where the material is compressed and bent and pressed into the punch hole.

The second phase is the area of plastic deformations. The punch is pushed into the sheet and the punch into the punch hole and the tension exceeds the yield point and at the edges of the punch and punch near the strength.

In the third phase, cracks begin to form at the edges, which then widen until the material is torn off.

How do we classify cutting according to the design of knives?

cutting with parallel knives,

with bent knives,

with circular knives,

profile knives and bars.

Define the term reverse shearing

Reverse cutting is based on the clamping of the blank so that the tensile components of the stress are not shown.

Describe increased speed cutting

Cutting with increased speed is based on minimizing the depleted plasticity to a minimum, the crack paths from the cutting edges are very close and result in perpendicular and planar cutting surfaces.

All this is possible only at critical speeds, for carbon steels around 3 to 5 m. s-1.

Test 3 STT III

Describe the work force calculation and give the formula for the calculation

For cold extrusion, large deformation forces are required which depend on the chemical composition of the material, preparation and heat treatment, lubrication, tool geometry (the greater, the greater the force), the size of the reduction (the greater, the greater the force), the wall thickness less, the more power), the type of machine. The forces and labor required are very difficult to calculate and will not be mentioned here. The deformation resistance during cold extrusion increases with the degree of hardening of the material and then we calculate

$$k_{ostf} = (k_{o1} + k_{o2}) / 2,$$

The extrusion is divided according to the direction of material and tool movement

forward,

retroactive,

combined,

side,

radial.

Describe tube extrusion technology

In tube extrusion technology, the billet is a rolled billet of the required length. Mostly followed by heating and proper punching and extrusion in a forward way. At the end of the process, the residue remains in the matrix, the technological waste that must be removed. The degree of deformation is large, where the elongation coefficient is 8 to 25 (from a semi-product with a length of eg 700 mm and a diameter of 200 mm, a pipe of 6 to 18 m can be produced).

What is the name of the bending tool and how can we divide bending according to the technology?

The bending tool is a bending tool and the main parts are a bending machine and a bending machine. loading stops. The benders are divided according to the bending method and technology, most often for U- and V-shaped bending.

What is the advantage of forging on horizontal forging machines?

Forging on horizontal forging machines enables partial or even complete automation of the production process.

These are essentially horizontal crank presses suitable mainly for ramming from rod material and working with closed dies.

The machine works by moving the bar to the forging position, to the stop. This precisely determines the volume of the forged material. Then, the two-piece block grips the bar and the stop is retracted. In this phase, the protruding end of the rod heats up, most often inductively today.