

Ministry of Education and Science of Ukraine
National Technical University
“Kharkiv Polytechnic Institute”

Department of Mechanical Engineering Technology and Metal-Cutting Machines

PROGRAM

of a qualification exam at the educational qualification level "bachelor"

Field of knowledge **13 Mechanical engineering**

Specialty **131 Applied Mechanics**

Educational program **Applied Mechanics**

Block of disciplines "**Technology of automated production**"

SUMMARY

The program is compiled in accordance with the requirements of the Ministry of Education and Science of Ukraine, the standard of education and the order of NTU "KhPI" from 7.04.2022 №120 ОД "On the redistribution of credits and certification of applicants for the first level of education."

The purpose of the qualifying exam is to assess the level of knowledge of the graduate at the educational qualification level "Bachelor" in the specialty 131 - Applied Mechanics.

Graduates must:

– know the basic concepts, definitions, laws and be able to solve applied problems in the disciplines of professional training of the first (bachelor's) level:

"Parts of machines";

"Applied Materials Science";

"Theory of mechanisms and machines";

"Hydraulics";

"Interchangeability, standardization and technical measurements in mechanical engineering";

"Technological bases of mechanical engineering";

– know the basic concepts, definitions and be able to solve applied problems of specialization.

CONTENT OF THE PROGRAM

The program is based on the disciplines of professional training of the first (bachelor's) level: "Parts of machines", "Applied Materials Science", "Theory of Mechanisms and Machines", "Hydraulics", "Interchangeability, Standardization and Technical Measurements in Mechanical Engineering", "Technological bases of mechanical engineering".

Parts of machines – general definitions, section "Mechanical transmissions": gears, transmissions by flexible communication.

Applied materials science – general definitions, section "Metallurgy".

Theory of mechanisms and machines – general definitions, section "Structure of mechanisms and machines".

Hydraulics – general definitions, theoretical foundations of hydraulics: hydrostatics, hydrodynamics.

Interchangeability, standardization and technical measurements in mechanical engineering – general definitions, section "Unified system of tolerances and landings of smooth cylindrical, threaded, keyed and splined connections, gears and worm gears".

Technological bases of mechanical engineering – general definitions, bases of the theory of accuracy, basing, productivity, design of technological processes.

LIST OF QUALIFICATION EXAM QUESTIONS

PARTS OF MACHINES

1. The part (detail) is:

- 1) the finished product;
- 2) a product made of one material;
- 3) a product made without the use of assembly operations;
- 4) the product meets all the above factors;
- 5) unfinished product.

2. Reducer is a mechanical transmission designed for

- 1) decrease of revolutions per minute;
- 2) increase of revolutions per minute;
- 3) increase of capacity;
- 4) decrease of capacity;
- 5) maintaining of revolutions per minute.

3. The gear ratio of mechanical transmission is the ratio of input and output

- 1) angles of rotation;
- 2) speeds;
- 3) torques;
- 4) powers;
- 5) accelerations.

4. What is the advantage of gear transmission over other belt drives

- 1) relatively smaller dimensions;
- 2) greater reliability in work;
- 3) greater manufacturability in manufacturing;
- 4) constant gear ratio;
- 5) lower cost.

5. The main criterion for the working capacity of the belt drive is

- 1) heat resistance of the belt;
- 2) traction capacity;
- 3) tensile strength of the belt;
- 4) wear resistance of pulleys;
- 5) durability of the belt.

6. What is the minimum value of the angle of arc of contact of the belt of the smaller pulley in the V-belt gears?

- 1) 90° ;
- 2) 110° ;
- 3) 130° ;
- 4) 150° ;
- 5) 180° .

7. Which drive chain allows to carry out work of chain transfer rather smoothly and silently

1) bushing; 2) gear; 3) roller; 4) all equally; 5) none of the above.

8. What will lead to chain wear

1) to the destruction of the rollers;
2) to the destruction of the bushings;
3) to the destruction of the plates;
4) to breaking the engagement between the sprocket and the chain (chain jumping);
5) turning of rollers and plugs.

9. What is the angle of intersection of the axes of the shafts in bevel gears is the most common?

1) 60°; 2) 75°; 3) 90°; 4) 120°; 5) 150°

10. A gear with a smaller number of teeth (input gear) is called

1) wheel; 2) gear; 3) satellite; 4) sprocket; 5) pulley.

APPLIED MATERIAL SCIENCE

1. The temperature at which the metal completely changes from solid to liquid is:

1) Melting point;
2) Critical temperature;
3) Recrystallization temperature.

2. Complex substances formed from several metals due to diffusion are:

1) Alloys;
2) Non-ferrous metals;
3) Plastics.

3. The ability of a metal without collapsing to change shape under the action of load and retain the changed shape after removal of the load is:

1) Strength;
2) Hardness;
3) Plasticity.

4. Cast iron is:

1) Iron-carbon alloy;
2) Non-ferrous alloy;
3) Non-metallic material.

5. By purpose cast irons are:

- 1) Gray, white, malleable, high-strength;
- 2) Steel smelting, phosphorus, foundry;
- 3) Pre-eutectic, eutectic, super-eutectic.

6. Steel is:

- 1) Alloy of iron with carbon (carbon up to 2%);
- 2) Alloy of iron with carbon (carbon up to 7%);
- 3) Alloy of iron with alloying elements.

7. Steel grade indicates:

- 1) The composition of steel;
- 2) Mechanical properties of steel;
- 3) Chemical properties of steel.

8. Phosphorus and sulfur in cast irons and steels are:

- 1) Technological impurities;
- 2) Harmful impurities;
- 3) Special impurities.

9. The purpose of steel is divided into:

- 1) Pre-eutectoid, eutectoid, over-eutectoid;
- 2) Structural, instrumental, special purpose;
- 3) Calm, semi-calm, boiling.

10. The carbon steels by chemical composition are divided into:

- 1) Low-alloy, medium-alloy, high-alloy;
- 2) Low carbon (up to 0.3% C), medium carbon (0.3-0.7% C), high carbon (0.7% - 1.4% C);
- 3) Qualitative, high quality.

THEORY OF MECHANISMS AND MACHINES

1. The number of links in the structural Assur's group should be

- 1) odd;
- 2) even;
- 3) not more than four;
- 4) any number;
- 5) not less than three.

2. Crank link has movement

- 1) translational;
- 2) rotating;
- 3) complex;
- 4) oscillating;

5) plane-parallel.

3. The link that connects the crank and the slider in the crank-slider mechanism is called

- 1) rocker arm;
- 2) pusher;
- 3) connecting rod;
- 4) coulisse;
- 5) riser.

4. The machine unit is a combination of:

- 1) technological machine and engine machine;
- 2) transport and information machines;
- 3) information and technological machines;
- 4) information machine and engine machine;
- 5) transport machine and engine machine.

5. The working stroke of the machine is

- 1) the period of movement without load;
- 2) the period of movement without taking into account the forces of friction;
- 3) the period of movement when the technological force acts;
- 4) full period of movement;
- 5) the period of movement, taking into account the forces of friction.

6. The gearing module is measured in

- 1) meters;
- 2) millimeters;
- 3) centimeters;
- 4) degrees;
- 5) radians.

7. To gear transmissions with mobile axes of rotation relate

- 1) cylindrical gears;
- 2) bevel gears;
- 3) planetary gears;
- 4) worm gears;
- 5) ordinary gears.

8. The main task of force calculation is to find

- 1) reactions in all kinematic pairs;
- 2) forces of weight of links;
- 3) forces and moments of useful resistance of transmission;
- 4) forces of inertia of links;
- 5) moments of inertia of the links.

9. The leading link in the cam mechanism is

- 1) cam;
- 2) pusher;
- 3) rocker arm;
- 4) roller;
- 5) spring.

10. The problem of dynamic analysis is a definition

- 1) the law of motion of the mechanism;
- 2) speeds and accelerations of the links of the mechanism;
- 3) forces and reactions in the kinematic pairs of the mechanism;
- 4) forces of inertia of links;
- 5) moments of inertia of the links.

HYDRAULICS

1. The basic equation of hydrostatics allows to:

- 1) determine the pressure acting on the free surface;
- 2) determine the pressure at the bottom of the tank;
- 3) determine the pressure at any point of the volume;
- 4) determine the pressure acting on the body immersed in the liquid;
- 5) determine the pressure acting on the walls of the tank.

2. Pascal's law says:

- 1) the pressure applied to the outer surface of the fluid is transmitted to all points of the fluid in all directions equally;
- 2) the pressure applied to the outer surface of the fluid is transmitted to all points of this fluid in all directions in accordance with the basic equation of hydrostatics;
- 3) the pressure applied to the outer surface of the liquid increases with distance from the free surface;
- 4) the pressure applied to the outer surface of the liquid is equal to the sum of the pressures applied from other sides of the considered volume of liquid.
- 5) the pressure applied to the outer surface of the liquid decreases with distance from the free surface.

3. Bernoulli's equation for two different flow cross sections gives the relationship between

- 1) pressure, flow and speed;
- 2) velocity, pressure and Coriolis coefficient;
- 3) pressure, velocity and geometric height;
- 4) geometric height, velocity, flow;
- 5) velocity, pressure.

4. The Coriolis coefficient in the Bernoulli equation characterizes

- 1) fluid flow regime;

- 2) the degree of hydraulic resistance of the pipeline;
- 3) change of velocity pressure;
- 4) the degree of reduction of the total energy level.
- 5) change of full pressure.

5. Hydraulic resistance is

- 1) the resistance of the liquid to change the shape of its channel;
- 2) the resistance that prevents the free passage of fluid;
- 3) the resistance of the pipeline, which is accompanied by energy losses of the liquid;
- 4) the resistance at which the speed of movement of liquid on the pipeline falls.
- 5) the resistance at which the speed of movement of liquid on the pipeline increases

6. What parameters the Reynolds number depends on

- 1) the diameter of the pipeline, the kinematic viscosity of the fluid and the velocity of the fluid;
- 2) the loss of liquid, the temperature of the liquid, the length of the pipeline;
- 3) the dynamic viscosity, density and velocity of the fluid;
- 4) the speed of the liquid, the roughness of the walls of the pipeline, the viscosity of the liquid;
- 5) the roughness of the walls of the pipeline, the viscosity of the liquid.

7. What is cavitation?

- 1) the effect of fluid pressure on the walls of the pipeline;
- 2) the movement of fluid in open channels, associated with intense stirring;
- 3) local change of hydraulic resistance;
- 4) change in the physical state of the fluid when moving in closed channels, associated with a local pressure drop;
- 5) local pressure change.

8. What is the main cause of pressure loss in local hydraulic supports?

- 1) the presence of vortex formation in places of change in the configuration of the flow;
- 2) friction of the fluid against the inner sharp edges of the pipeline;
- 3) change the direction and velocity of fluid movement;
- 4) the roughness of the walls of the pipeline and the viscosity of the liquid;
- 5) change in a free cross-sectional area.

9. What is perfect jet compression?

- 1) the greatest compression of the jet in the absence of the side walls of the tank and the free surface;
- 2) the greatest compression of the jet under the influence of the side walls of the tank and the free surface;
- 3) compression of the jet, which does not change the shape of the cross section;

- 4) the least possible compression of the jet in the immediate vicinity of the hole;
- 5) compression of the jet at the end through the cylindrical nozzles.

10. The characteristic of the pump is called

- 1) the dependence of pressure and flow changes when changing the shaft speed;
- 2) its geometric characteristics;
- 3) its technical characteristics: nominal pressure, flow rate and speed of the shaft, efficiency;
- 4) the dependence of the pressure generated by the pump on its supply at a constant speed of the shaft;
- 5) the dependence of the pump supply on its speed.

INTERCHANGEABILITY, STANDARDIZATION AND TECHNICAL MEASUREMENTS IN MECHANICAL ENGINEERING

1. How is the smallest limit size of the hole calculated?

- a) $D_{\max} = D + ES$;
- б) $D_{\min} = D + EI$;
- в) $D_{\phi} = D + E_{\phi}$;
- г) $d_{\max} = d + es$;
- д) $d_{\min} = d + ei$;
- е) $d_{\phi} = d + e_{\phi}$.

2. The actual size of the shaft is appropriate if:

- a) $D_{\min} \leq D_{\phi} \leq D_{\max}$;
- б) $D_{\phi} < D_{\min}$;
- в) $D_{\max} < D_{\phi}$;
- г) $d_{\min} \leq d_{\phi} \leq d_{\max}$;
- д) $d_{\phi} < d_{\min}$;
- е) $d_{\max} < d_{\phi}$.

3. Determine the conditional mark of clearance fit in the hole system:

- a) $\text{Ø}25 H7/t7$;
- б) $\text{Ø}16 H7/d6$;
- в) $\text{Ø}10 G7/h6$;
- г) $\text{Ø}40 Js7/h7$;
- д) $\text{Ø}64 S8/h7$;
- е) $\text{Ø}100 H8/n7$.

4. According to which formula is the lowest ultimate interference calculated?

- a) $ES - ei$;
- б) $ei - ES$;

- В) $ES - EI$;
- Г) $EI - es$;
- Д) $es - EI$;
- е) $es - ei$.

5. Fields of tolerances of shafts with which the main deviations are used for the formation of transitional fits in the hole system:

- а) $A ; B ; C ; D ; F$.
- б) $G ; H ; P ; R ; S$.
- в) $J_s ; k ; m$.
- г) $a ; b ; c ; d ; f ; g$.
- д) $r ; s ; t ; x ; z$.
- е) $E ; J_s ; K ; P ; N$.

6. Determine the tolerance width of the sleeve keyway for the normal nature of the key width connection.

- а) $H9$;
- б) $D10$;
- в) $N9$;
- г) J_s9 ;
- д) $P9$;
- е) $h9$.

7. What types of centering are provided for splined joints?

- а) Kinematic, smooth operation, tooth contact, lateral clearance.
- б) Free, normal, dense.
- в) Accurate, medium, rough.
- г) By outer diameter, inner diameter, width of the splines.
- д) Short, normal, long.
- е) Constructive, technological, operational.

8. How to set the roughness parameters on the fitting surfaces of the shafts under the bearing rings?

- а) Take into account which surfaces are working and which are not working.
- б) Take into account which surfaces are centered and which are not centered.
- в) By type of load.
- г) Take into account the accuracy class of the rolling bearing and the nominal size of the fitting surface.
- д) Based on quality and nominal size.

9. How does the drawing point the splined sleeve, made with centering on the outer diameter?

- а) $d-8x36H7x40x7H8$.

- б) $D-8x36x40H7x7H8$.
- в) $b-8x36x40H12x7H8$.
- г) $d-8x36g6x40x7f8$.
- д) $b-8x36x40a11x7f8$.
- е) $D-8x36x40g6x7f8$.
- ж) $D-8x36x40H7/g6x7H8/f8$.
- з) $d-8x36H7/g6x40x7H8/f8$.
- и) $b-8x36x40x7H8/f8$.

10. Connection with nominal size $D = d = 16$ mm, $ES = -18$ μm , $EI = -36$ μm , $es = 0$, $ei = -18$ μm are given. What is the nature of the fit and why are the values of the limit clearances (interferences)?

- а) transition, $N_{\text{max}}=36$ μm , $S_{\text{max}}=36$ μm .
- б) with clearance, $S_{\text{max}}=36$ μm , $S_{\text{min}}=0$.
- в) with interference, $N_{\text{max}}=36$ μm , $N_{\text{min}}=0$.
- г) with clearance, $S_{\text{max}}=36$ μm , $S_{\text{min}}=-36$ μm .
- д) with interference, $N_{\text{max}}=36$ μm , $N_{\text{min}}=-36$ μm .
- е) transition $N_{\text{max}}=18$ μm , $S_{\text{max}}=18$ μm .

TECHNOLOGICAL BASES OF MECHANICAL ENGINEERING

1. The manufacturing process is

- а) all stages of manufacture of the product or machine
- б) simultaneous execution of identical operations on several sites
- в) the totality of all actions of people and tools of production required at the enterprise for the manufacture of products
- г) preparation of means for the production and maintenance of jobs

2. The principle of specialization of the manufacturing process is:

- а) organization of manufacturing of products of limited nomenclature;
- б) organization of manufacturing of the required amount of products at all sites;
- в) simultaneous performance of the same operations in several sites;
- г) organization of the shortest path of the workpiece in the workplace.

3. Technological operation is

- а) the actions of the worker and the mechanisms necessary to perform the main transition
- б) each new fixed position of the object of production together with the device
- в) the completed part of the technological process performed at one workplace
- г) completed set of actions aimed at implementing the transition or part of it.

4. Technological transition is

- а) completed part of the technological process performed at one workplace
- б) completed part of the operation, performed by the same means of technological equipment at constant modes and position of the workpiece

- c) one-time relative movement of the device and the workpiece, as a result of which one layer of material equal to the depth of cut is removed from its surface
- d) each new fixed position of the object of production together with the fixture

5. Location (basing) is

- a) providing immobility to the workpiece
- b) providing immobility to the cutting tool
- c) providing the workpiece with the necessary position on the selected coordinate system
- d) deprivation of the workpiece of 3 degrees of freedom

6. Technological base is

- a) the base is used to determine the position of the part or assembly unit in the product
- b) the base used to determine the relative position of the workpiece and the measuring instrument.
- c) the base belonging to this part and used to determine its position in the product.
- d) the base used to determine the position of the workpiece during manufacture or repair.

7. The following bases are used to base the prismatic body

- a) setting + double guide
- b) setting + guide + support
- c) double guide + support
- d) setting + double support

8. When processing flat and body parts often use the locating scheme

- a) on the plane and prisms
- b) on prisms with stop on the end
- c) on a plane and two fingers
- d) on prisms and a finger

9. Accuracy in mechanical engineering means:

- a) high accuracy of all product surfaces;
- b) the degree of conformity of the actual part obtained by machining the workpiece, in relation to the part specified in the drawing and technical conditions for manufacture
- c) high quality of all product surfaces (roughness)
- d) the duration of operation of the product surfaces

10. The allowance is called

- a) a layer (layer thickness) of the material removed from the surface of the workpiece to eliminate defects from pre-treatment

- b) an excess material on the surface of the workpiece, due to technological requirements, to simplify the configuration of the workpiece to facilitate the conditions of its production
- c) the difference between the largest and smallest limit values of the parameters of deviation from the specified parameters (nominal dimensions);
- d) a layer of material that is removed in one pass of the tool

11. Locating parts using short cylindrical surfaces

- a) setting + double support (centering) + rotary (support)
- b) double guide + setting + rotary (support)
- c) setting + support + rotary (support) + guide
- d) double guide + support + rotary (support)

12. _____ provides the highest quality surface of the hole

- a) Drilling
- b) Countersinking
- c) Reaming
- d) Counterboring

13. Reaming are most often used to

- a) correct the shape of the axis
- b) increase the accuracy of the size
- c) improve surface roughness
- d) change the shape of the surface

14. Honing allows you to achieve accuracy

- a) 11-10 quality
- b) 9-8 quality
- c) 7-6 quality
- d) 5-4 quality

15. The most productive method of obtaining long narrow slots

- a) slotting
- b) planning
- c) broaching
- d) milling

16. It is expedient to process ledges with

- a) face mill cutters;
- b) slab mill cutters;
- c) slide and face cutters;
- d) cutting-off mill cutters.

17. When processing gears by the method of copying are used

- a) shaping cutter;

- b) involute side milling cutter;
- c) countersinks;
- d) hob

18. To ensure the accuracy of the thread pitch when cutting with a tap on the machine is used

- a) no rigid mounting of the tap in the axial direction;
- b) rigid mounting of the tap in the axial direction.
- c) the rigidity of the machine tool-fixture-cutting tool-part system;
- d) stop at a rigid stop

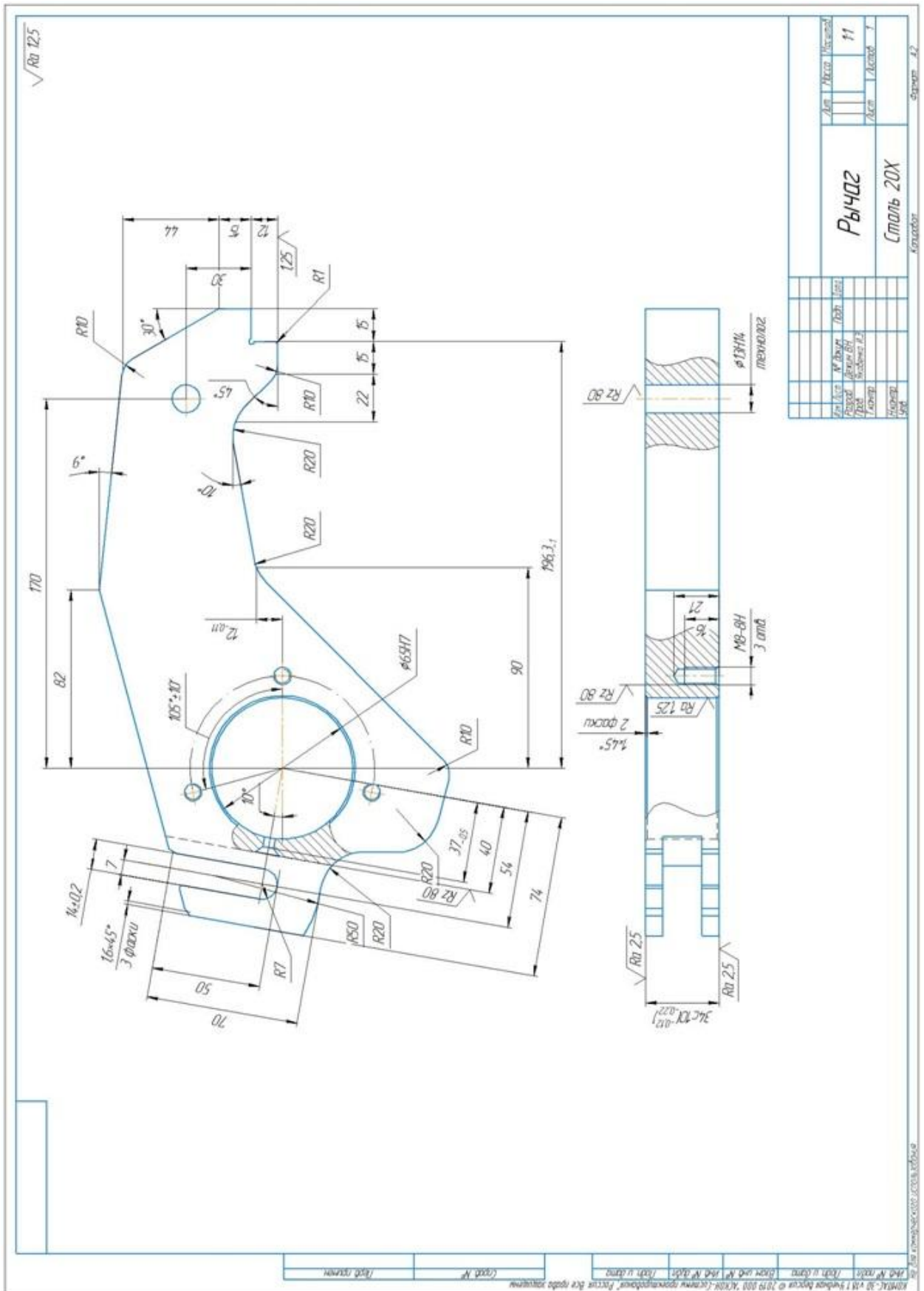
19. For finishing of thread surfaces is apply

- a) superfinishing
- b) grinding
- c) mandreling
- d) honing

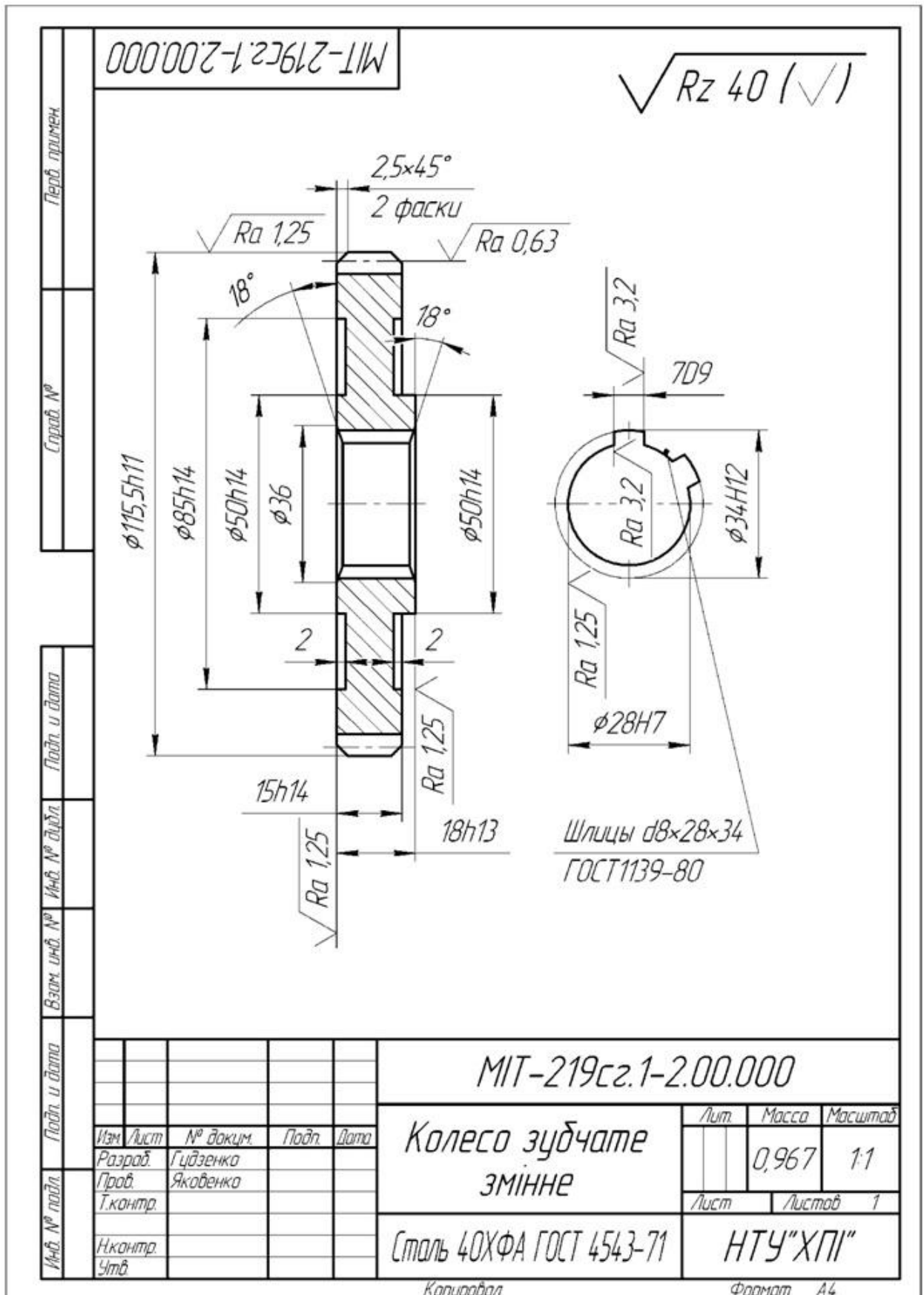
20. Emplacement in the centers during turning deprives the workpiece

- a) 6 degrees of freedom
- b) 5 degrees of freedom
- c) 4 degrees of freedom
- d) 3 degrees of freedom

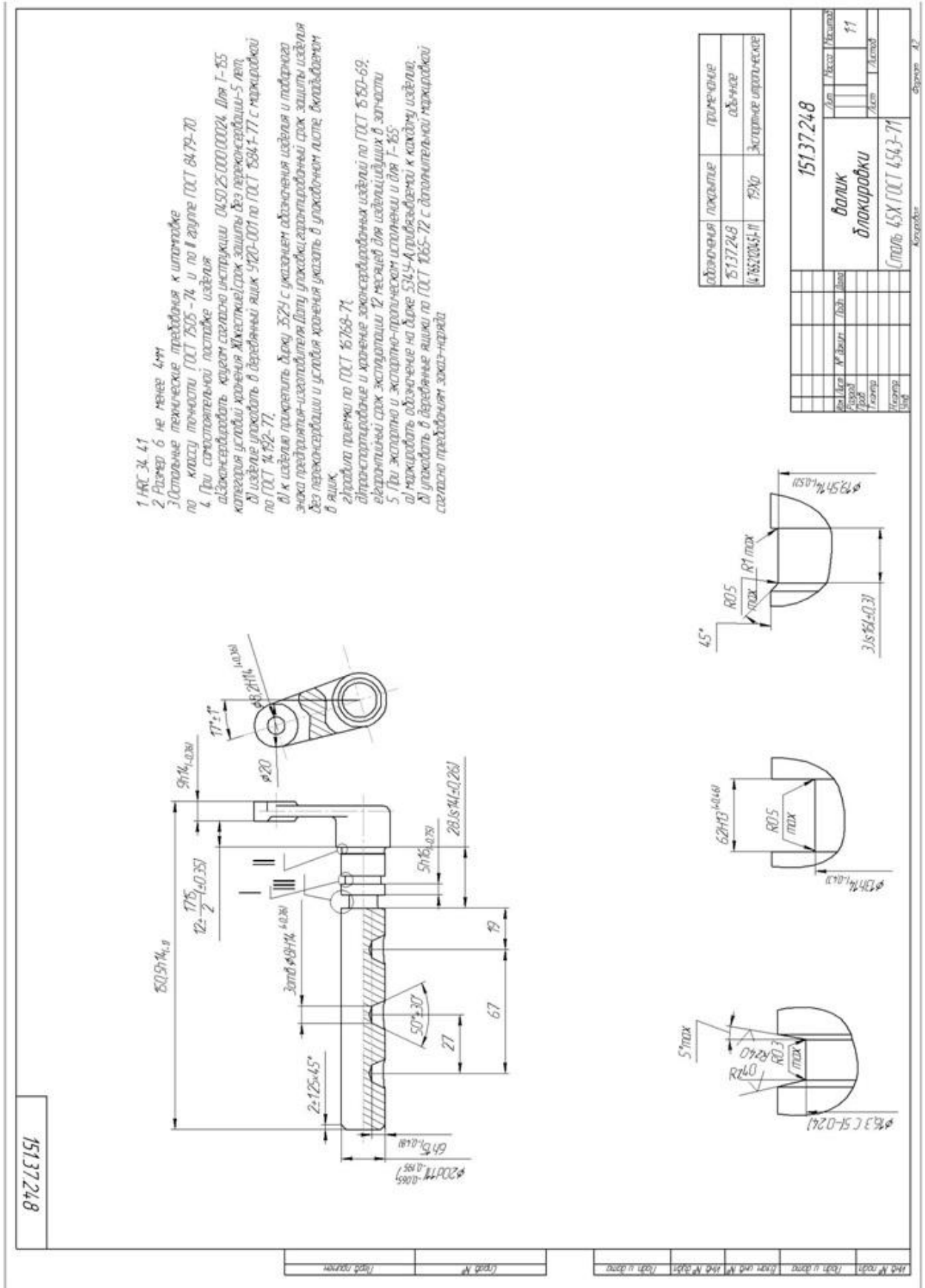
4. 1. To offer a route of processing of surfaces of a detail for mass production, the scheme of base of preparation and to calculate of cutting conditions on operation of drilling holes $\varnothing 13$.



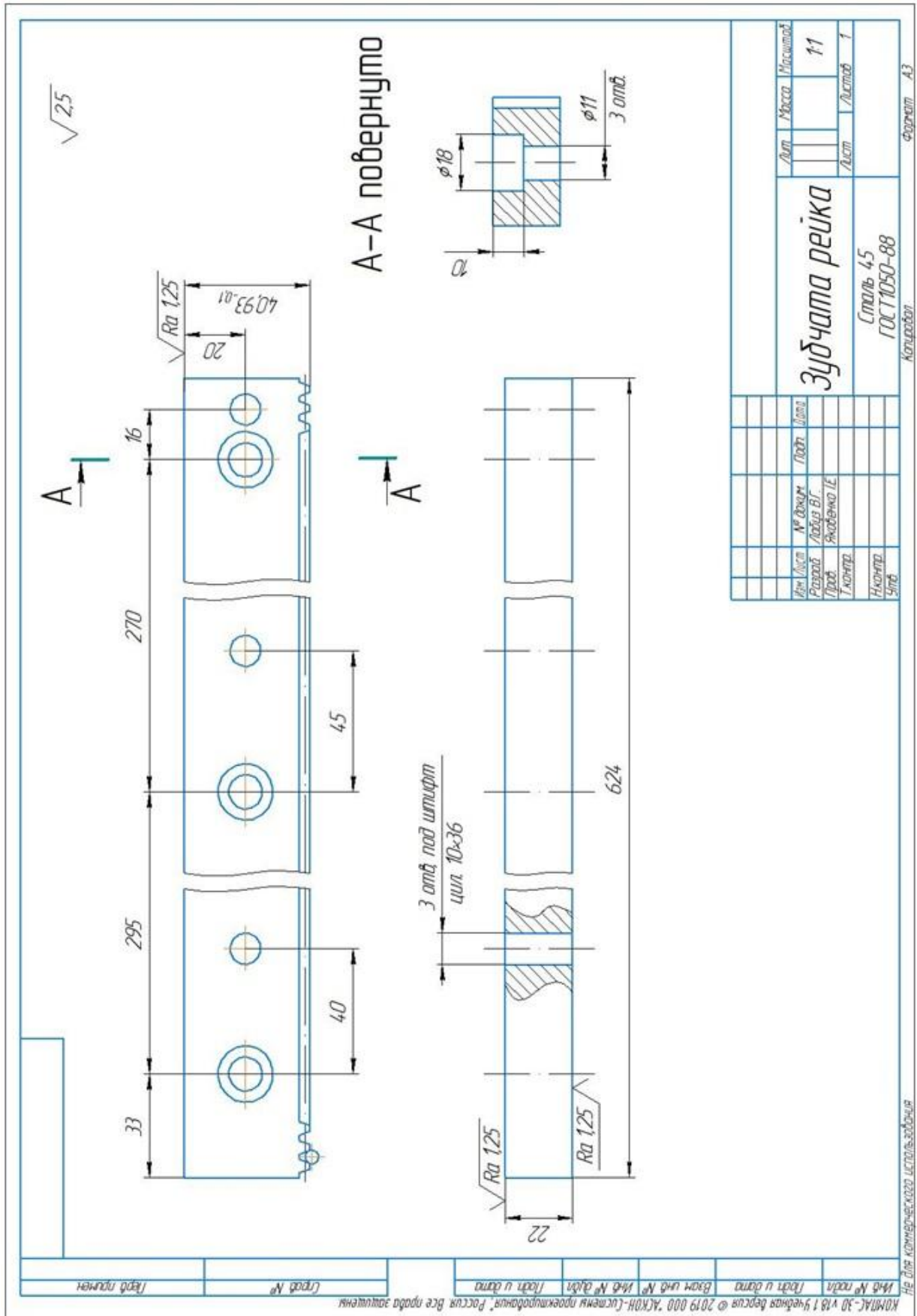
5. To offer a route of processing of surfaces of a detail for mass production, the scheme of base of preparation and to calculate of cutting conditions on operation of turning external contour.



6. To offer a route of processing of surfaces of a detail for mass production, the scheme of base of preparation and to calculate of cutting conditions on operation of turning $\varnothing 20$.



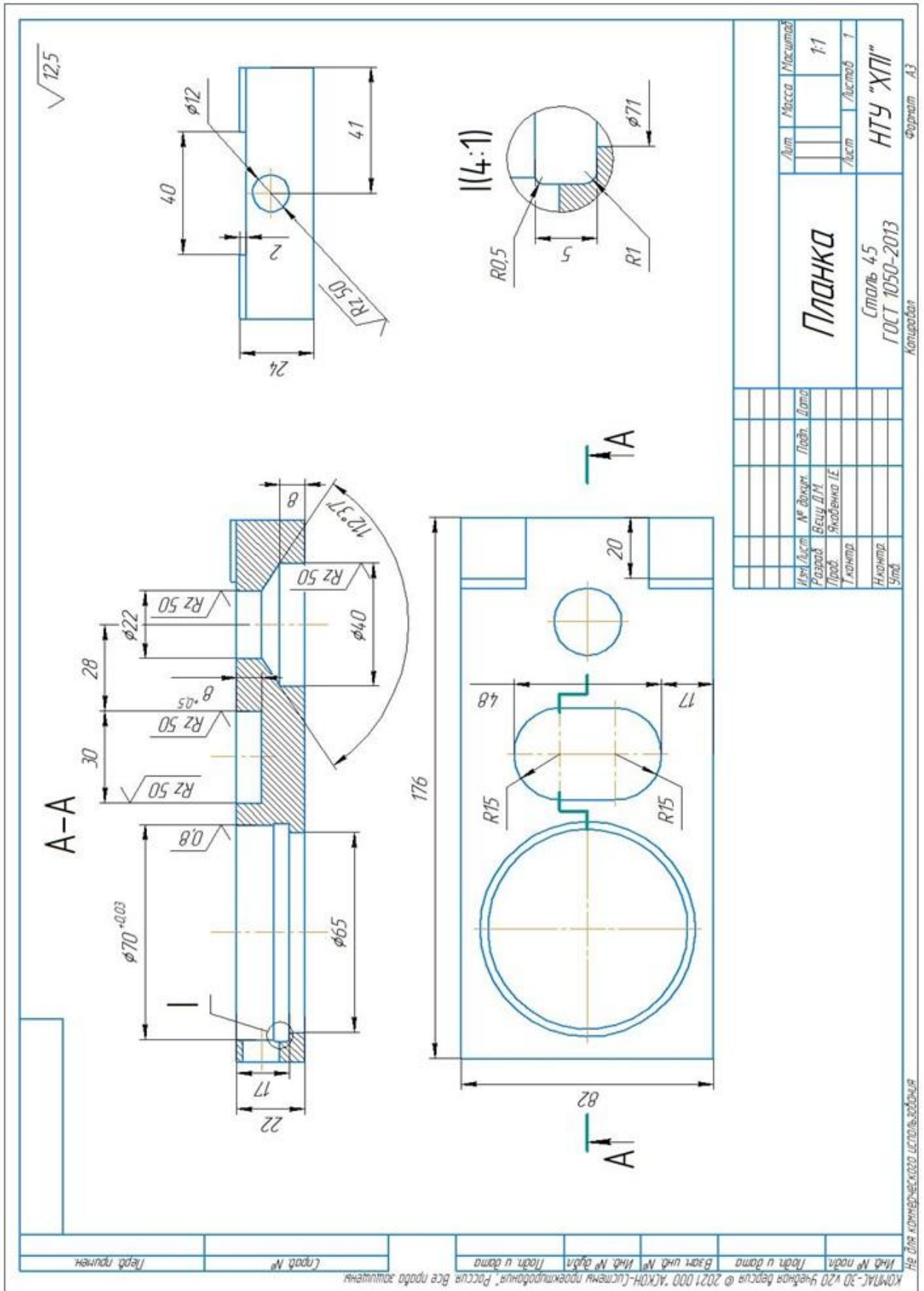
8. To offer a route of processing of surfaces of a detail for mass production, the scheme of base of preparation and to calculate of cutting conditions on operation of drilling holes $\varnothing 11$.



№ п/п	№ докум.	Подп.	Дата	Лист	Масштаб
1	1			1	1:1
Зубчатая рейка					
Сталь 45 ГОСТ 1050-88					
Копирчат А3					

КОМПАС-3D v18 1-е издание Версия © 2019 ООО "АКРОН-Системы проектирования", Россия. Все права защищены.
 Лист 1 из 1
 Имя файла: ...
 Имя пользователя: ...
 Имя компьютера: ...

9. To offer a route of processing of surfaces of a detail for mass production, the scheme of base of preparation and to calculate of cutting conditions on operation of milling of slot R15.



РЕКОМЕНДОВАНА ЛІТЕРАТУРА

«Parts of machines»

1. Fundamentals of Machine Component Design(6th edition),by R.C. Juvinall and K.M. Marshek. 2017.
2. Mechanical Engineers' Handbook, Materials and Engineering Mechanics by Myer Kutz. 2015.
3. Mechanical Design of Machine Components, Second Edition. 2015
4. Основи конструювання деталей машин : навч. Посібник \ Л.В. Курмаз. - Харків : Підручник НТУ “ХПІ”, 2010.
5. Деталі машин : підручник \ К.І. Заблонський. Одеса : АстроПринт, 1999.

«Applied Materials Science»

1. Fundamentals of Materials Science and Engineering by William D. Callister 2008.
2. Mechanical Engineers' Handbook, Materials and Engineering Mechanics by Myer Kutz. 2015.
3. Groover, Mikell P. Fundamentals of modern manufacturing: materials, processes and systems, 4th ed. 2010.
4. Гуляев А.П. Металловедение [Текст] : учеб-ник / А.П. Гуляев. – М. : Металлургия, 1986. – 544 с.
5. Лахтин Ю.М. Материаловедение [Текст] : учеб. Пособие / Ю.М. Лахтин, В.П. Леонтьева. – М. : Машиностроение, 1990. – 528 с.
6. Матеріалознавство [Текст] : підручник / С.С. Дяченко, І.В. Дощечкіна, А.О. Мовлян, Е.І. Плешаков ; ред. С.С. Дяченко ; Харківський нац. Автомобільно-дорожній ун-т. – Х. : ХНАДУ, 2007. – 440 с.
7. Материаловедение [Текст] : учебник / Б.Н. Арзамасов, В.И. Макарова, Г.Г. Мухин, В.И. Силаева ; общ. Ред. Б.Н. Арзамасов. – М. : МГТУ, 2008.– 648 с.

«Theory of mechanisms and machines»

1. Theory of Machines and Mechanisms by John J. Uicker & Gordon R. Pennock & Joseph E. Shigley. 2017.
2. Mechanism and Machine Theory by Ashok G. Ambekar. 2007.
3. Теория механизмов и машин : учебник \ К.И. Заблонский, Б.М. Щекин, И.М. Белоконев. -Киев : Выща шк., 1989.

4. Теория механизмов и машин : учебник. – 4-е изд., перераб. И доп. \ И.И. Артоболевский. – Москва : Наука, 1988.

«Hydraulics»

1. Fluid Mechanics & Hydraulic Machines By R K Bansal 9 Ed. 2015.

2. Fluid mechanics and hydraulic machines by Yola. 2008.

3. Гідравліка, гідравлічні машини і гідропривід : підручник \ В.Р. Кулінченко. Київ : Центр навч. літ., 2006.

4. Гидравлика, гидромашины и гидроприводы : учебник. - 2-е изд., перераб. \ Т.М. Башта [и др.] Москва : Машиностроение, 1982.

«Interchangeability, standardization and technical measurements in mechanical engineering»

1. Якушев А.И. и др. Взаимозаменяемость, стандартизация и технические измерения: Учебник. – 5-е изд., перераб. и доп. – М.: Машиностроение, 1979.

2. Зябрева Н.П. и др. Пособие по решению задач по курсу «Взаимозаменяемость, стандартизация и технические измерения». – М.: Высш. шк., 1977.

«Technological bases of mechanical engineering»

1. Groover, Mikell P. Fundamentals of modern manufacturing: materials, processes and systems, 4th ed. 2010.

2. Youssef, Helmi A. Machining technology : machine tools and operations / Helmi A. Youssef, Hassan El-Hofy.

3. K. Venkataraman. Design of Jigs, Fixtures and Press Tools. 2018.

Graham T. Smith, Cutting Tool Technology: Industrial Handbook. 2008.

4. Технологія машинобудівних підприємств: підручник / В. Л. Дикань, Ю. Є. Калабухін, Н. Є. Каличева та ін., за заг. ред. В. Л. Диканя. – Харків: УкрДУЗТ, 2020. – 386 с., рис. 38, табл. 10.

5. Технологічні основи машинобудування. [Електронний ресурс]: підручник для студ. спеціальностей 131 «Прикладна мехеніка», 133 - «Галузеве машинобудування» / С.С. Добрянський, Ю.М. Малафєєв; КПІ ім. Ігоря Сікорського. – Електронні текстові дані (1 файл: 13,4 Мбайт). –Київ : КПІ ім. Ігоря Сікорського, 2020. – 379 с.

6. Руденко П.О. Проектування технологічних процесів у машинобудуванні: навч. посіб. / П.О. Руденко. – К. : Вища шк., 1993. – 416 с.
7. Руденко П.О. Технологічні методи виробництва заготовок деталей машин: підруч. / П.О. Руденко, В.М. Плескач, Ю.О. Харламов. – Дніпропетровськ: Наука і освіта, 1999. – 254 с.

**CRITERIA FOR EVALUATION OF QUALIFICATION EXAM,
STRUCTURE OF EVALUATION, AND PROCEDURE FOR
EVALUATION OF GRADUATE PREPAREDNESS**

The exam ticket consists of 7 (seven) test tasks, one of each of the disciplines of professional training of the first (bachelor's) level:

"Parts of machines";

"Applied Materials Science";

"Theory of mechanisms and machines";

"Hydraulics";

"Interchangeability, standardization and technical measurements in mechanical engineering";

"Technological bases of mechanical engineering",

and a test problem and an applied specialization task.

The correct answer to each task in the disciplines of professional training is evaluated by 10 points. Wrong answer gives 5 points.

The answer to the test task and the applied task on specialization questions can be in the range from 5 to 40 points.

The result of the qualifying exam can range from 35 (thirty-five) to 100 (one hundred) points.

EVALUATION SYSTEM

The sum of points for all types of educational activities	Mark ECTS	Score on a national scale
90-100	A	perfect
82-89	B	good
74-81	C	
64-73	D	satisfactory
60-63	E	
35-59	FX	unsatisfactory with the possibility of repassing