General notes related to evaluating of the solutions.

1. The criteria presented below correspond to completely correct stages of the solution. Partial points for them were given taking into account the completeness and correctness of the stage implementation. In the presence of serious mistakes, points for the corresponding part of solution were significantly reduced or not awarded at all.

2. In the presence of a complete set of equations, some students did not present their solution, but immediately indicated the answer. This doesn't correspond the rules for solutions formalization. In such cases the final points for the corresponding part of solution was reduced by 1. If the answer was incorrect, the points for the equations solving were not awarded.

3. In some solutions of problems K1-2021 and K2-2021, vector expressions for velocities and accelerations were written and the correct answer was immediately indicated. At the same time, neither figures nor projection equations were presented. Considering that the correct answers in other works were obtained with incorrect solutions to the named problems, in the described cases, points for the corresponding part of the solution were not awarded.

Criteria for evaluating the particular problems

S1-2021

1. Getting a condition $\tan\alpha \le f$ – 2.5 points;

2. Getting a condition $\sin\alpha < r/R$ – 2.5 points (the obtained dependence of $\sin\alpha$ on P without analysis of the limit values $P_{\min} = 0$ and $P_{\max} = \infty$ – 1.5 points);

3. Determined $P_{\min}$ and $P_{\max}$ – 2.5 points for each including 0.5 points for the equations of equilibrium, 1 point – for getting the final formula, 1 point – for analysis of δ effect on the limit value.

S2-2021

1. 1 point for the choice of the minimum required number of objects of consideration, allowing to solve the problem, and the correct arrangement of reactions of external and internal connections.

2. Equilibrium equations for the full problem solution – 3 points if these equations are all correct and they allow to obtain the answer.

3. Equations system solution and definition of the spring torque – 4 points.

4. Finding projections of reactions at a point B – 2 points.

K1-2021

1. Determination of the ratio of angular velocities and the relation between the velocity of the point A velocity and the angular velocities – 5 points;

2. Obtained relations of angular accelerations – 5 points (written projection equations relating the points' accelerations without solving them – 1.5 points).

K2-2021

1. Obtained cylinder axis velocity –3.5 points;
2. Determined of the angular velocity of the thread – 1.5 points;
3. Obtained cylinder axis acceleration – 2 points;
4. Determination of the thread angular acceleration – 3 points.

Note: Because of the technical reasons, the task did not include the information about the thread length at the presented time moment. Therefore, all solutions with the correct equations containing any dimensions (length, height and etc at the presented time moment) were counted as correct.

D1-2021

1. Full system of correctly written equations allowing to obtain the final result – 2 points.
2. Obtaining the result for the case of cylinder rolling without slipping – 3 points;
3. Obtaining the result for the case of cylinder rolling with slipping for two cases – 3 points (if only one case was considered – 2 points);
4. If there is a solution for two cases + 0.5 points, for three cases – + 1 point.
5. Analysis of the condition for the transition from rolling with slipping to rolling without slipping – 1 point (0.5 points for the condition).

Note: If the prism motion was not taken into account in all written equations and parts of solution the maximal score for solution is 1 point.

D2-2021

1. Correctly composed system of motion equations considering the presence of the system three degrees of freedom – 4 points.
2. Obtained differential equation with respect to one variable – 2.5 points.
3. Solved differential equation and obtained required variables – 3.5 points.