**Variant 1**

D

# A

R

The body with a mass of *M = 10 kg* is on a smooth horizontal plane at rest. On the circular channel with radius *R=1,6* m the point with mass 2 kg starts to move according to the law *S=AD=6πt2, m.*

Determine the movement of the body in 2 s after the beginning of movement.

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| Изображение выглядит как диаграмма, схематичный  Автоматически созданное описание | A plane mechanism with perfect constraints is at rest under the action of forces P, Q and a pair of forces with moment M applied to the link OA.  Using the principle of virtual displacements, determine the value of moment M.  Р = Q = 1Н, ОА = а = 1м, β = 60°.  The link ABC is a rectangular triangle with an angle at the vertex A 30°. |
| Изображение выглядит как диаграмма  Автоматически созданное описание | The mechanical system is driven by the force: F applied to body 1, and the force of gravity 1 and 3.  m1, m2, m3— system body masses,  ρ3 — inertia radius of the step block 3,  k — coefficient of sliding friction of the body 1.  Body 2 — homogeneous cylinder.  1) Determine acceleration of body 1. (You can choose any method, but be prepared to answer what other methods can be used, and what advantages and disadvantages they have).  2) Determine the velocity of body 1 when it moves by distance S. (It is recommended to use the theorem of the change in kinetic energy). |

**Variant 2**

Along the inclined face of a wedge weighing P, having a velocity V0 = 5 m/s, a load weighing 0.2 P moves with a constant relative velocity U0 = 4 m/s. Ignoring friction, determine the speed of the wedge if the load stops relative to the wedge.

60°°

*V*0

*U*0

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| Изображение выглядит как диаграмма, схематичный  Автоматически созданное описание | A plane mechanism with perfect constraints is at rest under the action of forces P, Q and a pair of forces with moment M applied to the link OA.  Using the principle of virtual displacements, determine the value of moment M.  Р = Q = 4Н, ОА = а = 1м, α = 30°, β = 60°.  The link ABC is a rectangular triangle with an angle at the vertex A 30°. |
| Изображение выглядит как диаграмма  Автоматически созданное описание | The mechanical system is driven by the force: F applied to body 1, and the force of gravity 1 and 3.  m1, m2, m3 — system body masses,  ρ2 — inertia radius of the step block 2,  k — coefficient of sliding friction of the body 1.  Body 3 — homogeneous cylinder.  1) Determine acceleration of body 1. (You can choose any method, but be prepared to answer what other methods can be used, and what advantages and disadvantages they have).  2) Determine the velocity of body 1 when it moves by distance S. (It is recommended to use the theorem of the change in kinetic energy). |

**Variant 3**

45°

A

*V*0

*aτ*

B

C

The prism 1 with a mass of M = 10 kg is located on a smooth horizontal surface and moves along it at a speed of V0 = 6 m/s. At some point in time, a point D of mass m = 2 kg with constant tangential acceleration *a*τ = 2 m/s begins to move along the smooth inclined face CB of the prism from position C. Determine the speed of the prism when point D passes half the distance CB.

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| Изображение выглядит как диаграмма, схематичный  Автоматически созданное описание | A plane mechanism with perfect constraints is at rest under the action of forces P, Q and a pair of forces with moment M applied to the link OA.  Using the principle of virtual displacements, determine the value of moment M.  Р = Q = 2Н, ОА = а = 1м, α = 30°, β = 60°.  The link ABC is a rectangular triangle with an angle at the vertex B 30°. |

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| Изображение выглядит как диаграмма  Автоматически созданное описание | The mechanical system is driven by the force: F applied to body 1, and the force of gravity 1, 3 and 4.  m1, m2, m3, m4 — system body masses,  k — coefficient of sliding friction of the body 1.  Body 2 and 3 — homogeneous cylinder.  1) Determine acceleration of body 1. (You can choose any method, but be prepared to answer what other methods can be used, and what advantages and disadvantages they have).  2) Determine the velocity of body 1 when it moves by distance S. (It is recommended to use the theorem of the change in kinetic energy). |

**Variant 4**

*φ*

Ignoring friction, determine the maximum horizontal displacements of a cube of mass M with vibrations of a homogeneous rod of mass m = 0.5 M and length 2*l* with amplitude *ϕ*0.

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| Изображение выглядит как текст, часы  Автоматически созданное описание | A plane mechanism with perfect constraints is at rest under the action of forces P, Q and a pair of forces with moment M applied to the link OA.  Using the principle of virtual displacements, determine the value of moment M.  Р = Q = 2Н, ОА = а = 1м, α = 30°, β = 60°.  The link ABC is a rectangular triangle with an angle at the vertex B 30°. |

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| Изображение выглядит как диаграмма  Автоматически созданное описание | The mechanical system is driven by the force: F applied to body 1 and the force of its weight.  m1, m2, m3— system body masses,  p2 — inertia radius of the step block 2,  k — coefficient of sliding friction of the body 1.  Body 3— homogeneous cylinder.  1) Determine acceleration of body 1. (You can choose any method, but be prepared to answer what other methods can be used, and what advantages and disadvantages they have).  2) Determine the velocity of body 1 when it moves by distance S. (It is recommended to use the theorem of the change in kinetic energy). |

**Variant 5**

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| Изображение выглядит как диаграмма, схематичный  Автоматически созданное описание | A plane mechanism with perfect constraints is at rest under the action of forces P, Q and a pair of forces with moment M applied to the link OA.  Using the principle of virtual displacements, determine the value of moment M.  Р = Q = 2Н, ОА = а = 1м, α = 30°, β = 60°.  The link ABC is a rectangular triangle with an angle at the vertex B 30°. |
| Изображение выглядит как диаграмма  Автоматически созданное описание | The mechanical system is driven by the force: F applied to body 1 and the forces of gravity of bodies 1, 3 and 4.  m1, m2, m3,m4 — system body masses,  p3 — inertia radius of the step block 3,  k — coefficient of sliding friction of the body 1.  Body 2— homogeneous cylinder.  1) Determine acceleration of body 1. (You can choose any method, but be prepared to answer what other methods can be used, and what advantages and disadvantages they have).  2) Determine the velocity of body 1 when it moves by distance S. (It is recommended to use the theorem of the change in kinetic energy). |

Along the diagonal of a square plate with a mass of *M* = 10 kg, a point D with a mass of m = 2 kg moves according to the law *S* = AD = , m. Determine the horizontal movement of the plate 1 s after the start of the movement of the point. The plate is located on a smooth horizontal plane.

**Variant 6**

A

B

*V*0

D



A square plate with a mass of *M* = 10 kg moves along a smooth horizontal surface at a speed of V0 = 5 m/s. At some point in time, a point D with a mass of *m* = 4 kg with a constant tangential acceleration of m/s2 begins to move along the diagonal of the AB plate. Determine the speed of the plate 2 seconds after the start of movement.

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| Изображение выглядит как диаграмма, схематичный  Автоматически созданное описание | A plane mechanism with perfect constraints is at rest under the action of forces P, Q and a pair of forces with moment M applied to the link OA.  Using the principle of virtual displacements, determine the value of moment M.  Р = Q = 8Н, ОА = а = 1м, α = 30°.  The link ABC is a rectangular triangle with an angle at the vertex A 30°. |
| Изображение выглядит как диаграмма  Автоматически созданное описание | The mechanical system is driven by the force: F applied to body 1 and the forces of gravity of bodies 1and 3.  m1, m2, m3 — system body masses,  p2 - inertia radius of the step block 2,  k - coefficient of sliding friction of the body 1.  Body 3 - homogeneous cylinder.  1) Determine acceleration of body 1. (You can choose any method, but be prepared to answer what other methods can be used, and what advantages and disadvantages they have).  2) Determine the velocity of body 1 when it moves by distance S. (It is recommended to use the theorem of the change in kinetic energy). |