**CALCULUS OF VARIATIONS AND OPTIMIZATION METHODS**

**MIDTERM**

**Variant 1.**

1. Find the function, which satisfies the boundary condition  and minimize the integral

.

Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph. Calculate the value of the integral for an arbitrary linear function, which satisfies given boundary condition. Compare these results.

2. Minimizes the functional



and satisfies the boundary conditions



Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph. Calculate the value of the given functional for the linear function which satisfies the given boundary conditions. Compare these results.

**Variant 2.**

1. Consider the functional

.

Write Ostrogradsky equations.

2. Find the functions   which minimize the integral



with boundary conditions



Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph.

**Variant 3.**

1. Consider the functional

.

Write Ostrogradsky equations.

2. Find the function, which satisfies the boundary condition  and minimize the integral

.

Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph. Calculate the value of the integral for an arbitrary linear function, which satisfies given boundary condition. Compare these results.

**Variant 4.**

1. Minimizes the functional



and satisfies the boundary conditions



Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph. Calculate the value of the given functional for the linear function which satisfies the given boundary conditions. Compare these results.

2. Find the functions   which minimize the integral



with boundary conditions



Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph.

**Variant 5.**

1. Find the functions   which minimize the integral



with boundary conditions



Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph.

2. Minimize the integral

.

Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph. Calculate the value of the integral for an arbitrary linear function. Compare these results.

**Variant 6.**

1. Find the function  which minimize the integral



with boundary conditions



Find the general solution of Euler – Poisson equation which boundary conditions and the corresponding value of the given functional. Show the graph.

2. Minimizes the functional



and satisfies the boundary conditions



Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph. Calculate the value of the given functional for the linear function which satisfies the given boundary conditions. Compare these results.

**Variant 7.**

1. Minimize the integral

.

Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph. Calculate the value of the integral for an arbitrary linear function. Compare these results.

2. Consider the functional

.

Write Ostrogradsky equations.

**Variant 8.**

1. Minimizes the functional



and satisfies the boundary conditions



Find the general solution of Euler equation which boundary conditions and the corresponding value of the given functional. Show the graph. Calculate the value of the given functional for the linear function which satisfies the given boundary conditions. Compare these results.

2. Find the function  which minimize the integral



with boundary conditions



Find the general solution of Euler – Poisson equation which boundary conditions and the corresponding value of the given functional. Show the graph.