**Partial differential equations**

**Homework**

**Task 13. Finite difference method for the heat equation**

**Methodical instructions**

Consider the extended heat equation with initial condition

*u*(*x*,0) = *ϕ*(*x*), 0<*x<L*

and different variant of equation and the boundary conditions.

Table of parameter

|  |  |  |  |
| --- | --- | --- | --- |
| **variant** | **equation** | **left boundary condition** | **right boundary condition** |
| **1** | *ut* = *a*2*uxx +*(*ux*)2 + *f*(*x*,*t*) | *u*(0,*t*) = *p*(*t*) | *ux*(*L*,*t*)+*u*(*L*,*t*) = -*q*(*t*) |
| **5** | *ut* = *a*2*uxx -* 2*ux* + *f*(*x*,*t*) | *ux*(0,*t*) = *u*(0,*t*) | *u*(*L*,*t*) = -*q*(*t*) |
| **7** | *ut* = *a*2*uxx +*sin*ux* + *f*(*x*,*t*) | *u*(0,*t*) = *p*(*t*) | *ux*(*L*,*t*) = *u*(*L*,*t*) |

Task

1. Give the completely problem statement.
2. Give the approximation of the equation, initial condition and boundary conditions.
3. Write the completely algorithm of the finite difference method.