In the present paper we consider systems of partial differential equations not solved with respect to the time derivative. Such systems are often referred as systems not of Cauchy-Kovalevskaya type. Examples of such systems are the Sobolev system, the system of internal waves, the system of gravity-gyroscopic waves for the Boussinesq approximation and so on.

Denote by $W_{p,\gamma}^l$, $1 < p < \infty$, $\gamma > 0$, weighted Sobolev spaces with an exponential weight on time. As was shown earlier (see, for example, [1]), in a number of cases, boundary value problems for systems not of Cauchy-Kovalevskaya type are unconditionally solvable in $W_{p,\gamma}^l$ only for $p > p^* > 1$. Moreover, the restrictions on the power p can be reduced only by additional requirements on data of boundary value problems. For one class of initial-boundary value problems we established necessary and sufficient solvability conditions such as orthogonality conditions. In the present paper we research solvability of this class of initial-boundary value problems in special weighted Sobolev spaces $W_{p,\gamma,\sigma}^l$ introduced by G.V.Demidenko with an exponential weight on time and a power weight on spatial variables. We establish that one can decrease quantity of solvability conditions by choosing the weight parameter σ. This fact allows to weaken requirements on data in contrast to the case of $W_{p,\gamma}^l$.

References

1. Demidenko G.V., Uspenskii S.V. Partial Differential Equations and Systems not Solvable with Respect to Highest-Order Derivative. Nauchnaya Kniga, Novosibirsk, 1998, 456 p. (Russian); Marcel Dekker, New York, Basel, 2003, 490 p. (English).