The program of the final control in the discipline
«Applied analysis for Partial Differential Equation»

Specialty –7M05407 Mathematics
Course – 2
Language of study – Kazakh, language – English
2022, autumn semester

Form of final control – standard exam, oral, offline
Time to prepare an answer – 1 hour
Evaluation Policy – standard
Exam time – according to the schedule

List of questions submitted for the exam

Item № 1. Theoretical questions (Maximum score - 40 points)
1. Determination of the heat equation and its classical solution o
2. Approximation and convergence of the numerical method for the heat equation.
3. Generalized functions. Generalized derivatives. Sobolev spaces
4. Generalized solution of the mathematical physics problems. Relations between classical and generalized solution.
5. Physical sense of the generalized solution of the stationary heat equation. Generalized model
6. Approximation of the generalized model for the stationary heat
7. Convergence of the sequences and Cauchy principle
8. Picard method and compressing mapping theorem
9. Completeness of the spaces. Examples of incomplete spaces
10. Cantor's definition of the set of real numbers.
11. Applications of the completion theorem
12. Sequential generalized functions theory
13. Sequential extension of extremum problems
14. Sequential model of stationary heat transfer phenomenon.
15. Sequential models of mathematical physics problems

Item № 2. Practical questions. (Maximum score - 60 points)
1. Approximation of boundary problems.
2. Definition of classical and generalized solutions.
3. Generalized derivatives.
4. Using the Cauchy criterion for proving the convergence.
5. Method successive iteration.
6. Properties of the real numbers.
7. Completion of numerical spaces.
8. Properties of the sequential distributions.
9. Existence problem of optimization theory.
10. Convergence in functional spaces.
11. Using of sequential method.

<u>Item № 3.</u> Diagnosis of the situation in the practical solving of the problem. <u>(Maximum score - 20 points).</u>

1. It should indicate what effect is observed, what may be its causes and what should be done to overcome the difficulties encountered.
2. Algorithm divergence
3. Divergence of a sequence of controls under convergence of a sequence of functionals.
4. Obtaining different results with different initial approximations.
5. A large change in results with a small change in the parameters of the problem.