**Final control program for**

**the course «Generalized functions and applications»**

**for the 2023/2024 academic year**

**Faculty of Mechanics and Mathematics**

**Department of Mathematics**

**Name of the discipline:** Generalized functions and applications

**Course** 3

**Teacher:** S. Serovajsky, doctor of science, professor

**The form of the final control in the academic discipline** oral (traditional).

**Platform:** IS Univer

**Exam control is proctoring**

Proctoring technology ("proctor" - to control the course of the exam), proctors, as in a regular exam in the classroom, make sure that the examinees take the test honestly: they complete tasks independently and do not use additional materials. Both a specialist (face-to-face proctorship) and a program that controls the subject's desktop, the number of faces in the frame, extraneous sounds or voices, and even gaze movements (cyber proctorship) can monitor the progress of the online exam in real time via a webcam. A type of mixed proctoring is often used: a video recording of the exam with program notes is additionally viewed by a person and decides whether violations have actually occurred.

**The duration of the exam is** 120 minutes**.**

**Number of exam questions:** 3.

**THE RULES OF THE EXAM**

**IMPORTANT -** the exam is scheduled 30 minutes before the start, students must prepare for the exam in accordance with the requirements of the instructions.

**The topics on which the exam questions are compiled (program)**

1. Define ordinal (preordered set, partially ordered set, linearly ordered set), algebraic (groupoid, semigroup, monoid, group, vector space), topological (special topological spaces, metric spaces), measurable (measures, including probabilistic) structures on an abstract set consisting of a finite number of elements.

2. Define ordinal (preordered set, partially ordered set, linearly ordered set), algebraic (groupoid, semigroup, monoid, group, vector space), topological (special topological spaces, metric spaces), measurable (measures, including probabilistic) structures on specific sets (numbers, functions, etc.).

3. Prove or disprove that on a given set (numerical, functional, etc.) with a given structure (ordinal, algebraic, topological, measurable) the specified property is realized.

4. Describe the specific specified category, defining its objects, morphisms, subobjects and give examples of its properties and its complete and incomplete subcategories.

**THE LIST OF RECOMMENDED LITERATURE**

1. S. Serovajsky. Architecture of Mathematics. – London, Chapman and Hall/CRC, 2020

2. С.Я. Серовайский Архитектура математики. – Алматы, Print-S, 2005.

3. M. Potter. Set Theory and Its Philosophy: A Critical Introduction. – Oxford University Press, 2004.

4. S. Mac Lane. Categories for the Working Mathematician. Graduate Texts in Mathematics.  Springer-Verlag, 1998.

5. H. Eves. Foundations and Fundamental Concepts of Mathematics. – Dover Publications, INC, Mineola NY, 1990.

6. Вейль Г. Математическое мышление. – М., Мысль, 1984.

7. Гелбаум Б., Олмстед Дж. Контрпримеры в анализе. – М., Наука, 1967.

8. <https://www.youtube.com/user/TheCatsters>

9. <https://plato.stanford.edu/entries/category-theory/>

10. <https://cpb-us-w2.wpmucdn.com/u.osu.edu/dist/1/1952/files/2014/01/fom12pt5.31.00-1jkl4df.pdf>

Available online: Additional educational material is available on your page on the website univer.kaznu.kz in the EMSD section.

**Evaluation Criteria (Rating Scale):**

|  |  |  |  |
| --- | --- | --- | --- |
| **«Great» –** | А | 4,0 | 95-100 |
| А- | 3,67 | 90-94 |
| **«Fine» –** | В+ | 3,33 | 85-89 |
| В | 3,0 | 80-84 |
| В- | 2,67 | 75-79 |
| С+ | 2,33 | 70-74 |
| **«Satisfactorily» –** | С | 2,0 | 65-69 |
| С- | 1,67 | 60-64 |
| D+ | 1,33 | 55-59 |
| D- | 1,0 | 50-54 |
| **«Unsatisfactory» –** | FX | 0,5 | 25-49 |
| F | 0 | 0-24 |

**GRADING POLICY**

**BAK/MAG/DOC STANDARD EXAM: ORAL**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Criterion/score** | **Descriptors** | | | | |
|  | **Great** | **Fine** | **Satisfactorily** | **Unsatisfactory** | |
| **№** | **90–100% (27-30 score)** | **70–89% (21-26 score)** | **50–69% (15-20 score)** | **25–49% (8-14 score)** | **0–24% (0-7 score)** |
| **1 question**  **30 points** | **Knowledge**  **and understanding**  **theories**  **and course**  **concepts** | “**Great**” grade is given for an answer that contains an exhaustive explanation of the question, a detailed argumentation for each conclusion and statement, is constructed logically and consistently, and is supported by examples from the developed classroom topics. | “**Fine**”grade is given for an answer that contains a complete but not exhaustive coverage of the issue, an abbreviated argumentation of the main provisions, and allows for a violation of the logic and sequence of presentation of the material. The answer contains inaccurate use of terms. | “**Satisfactory**” grade is given for an answer that contains incomplete coverage of the questions proposed in the ticket, superficially argues the main points, in the presentation allows for violations of the logic and sequence of presentation of the material, and does not illustrate theoretical points with examples from the developed class notes. | Incorrect coverage of the posed questions, erroneous argumentation, factual and verbal errors, assumption of an incorrect conclusion. | Ignorance of basic concepts, theories...; Violation of the Rules for final control. |
| **2 question**  **30 points** | **Application of favorites**  **methods and technologies**  **to specific**  **practical tasks** | Complete completion of the educational assignment, a detailed, reasoned answer to the question posed, followed by solving practical problems of the course; | Partial completion of the educational assignment, incomplete, sometimes reasoned answer to the question posed with an incomplete solution to the practical problems of the course; illiterate use of scientific language norms in the course; | The material is presented in fragments, in violation of logical sequence, factual and semantic inaccuracies are made, and theoretical knowledge of the course is used superficially. | An irrational method of solving a task or an insufficiently thought-out answer plan; inability to solve problems, perform tasks in general; making mistakes and omissions that exceeds the norm. | Inability to apply knowledge and algorithms to solve tasks; inability to draw conclusions and generalizations. Violation of the Rules for final control. |

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| --- | --- | --- | --- | --- | --- | --- |
|  | **Criterion/score** | **Descriptors** | | | | |
|  | **Great** | **Fine** | **Satisfactorily** | **Unsatisfactory** | |
| **№** | **90–100% ((36-40 score) score)** | **70–89% (35-28 score)** | **50–69% ( (27-20 score)** | **25–49% (19-20 score)** | **0–24% (0-9 score)** |
| **3 question**  **40 points** | **Evaluating and analyzing the applicability of the chosen methodology to the proposed practical task, justifying the obtained result** | Consistent, logical and correct justification of scientific principles and the applied methodology and technology, literacy, compliance with the norms of scientific language, 1-2 inaccuracies in the presentation of the material are allowed that do not affect the generally correct conclusions (+ visualization of the results of the justification through graphical data). | 3-4 inaccuracies in the use of conceptual material, minor errors in generalizations and conclusions are allowed, which do not affect the good overall level of task completion. | Conclusions on the applicability of substantiated scientific provisions are vague and unconvincing; there are stylistic and grammatical errors, as well as inaccuracies in processing the results of a practical solution | The task was completed with gross errors, the answers to the questions were incomplete, the conceptual material and argumentation were poorly used. | The task has not been completed, there are no answers to the questions posed, materials and analysis tools have not been used. Violation of the Rules for final control. |

Exam papers consist of 3 questions. For correctly completed tasks, the maximum is 100 points, of which 30 points for the first question, 30 **score** for the second question, and 40 **score** for the third question.