THE OLYMPIAD "MASTERSIUM" FOR APPLICANTS TO THE MASTER'S PROGRAM

04/35/06 AGROENGINEERING (PROGRAM "TECHNICAL SERVICE IN THE AGRO–INDUSTRIAL COMPLEX")

METHODOLOGICAL RECOMMENDATIONS FOR PREPARATION

FOR THE QUALIFYING STAGE OF THE OLYMPIAD

2025/2026 ACADEMIC YEAR

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QUALIFYING STAGE

The qualifying stage of the Olympiad "Mastersium" for applicants to the magistracy (hereinafter referred to as the Olympiad) in the field of training 04/35/06 Agroengineering (program "Technical services in the agro–industrial complex") is held remotely.

The assignment questions are compiled for each participant individually in automatic mode. Each variant of the Olympiad work of the qualifying stage includes tasks that assume the readiness of the participants of the Olympiad within the framework of the Federal State Educational Standard.

1 (one) astronomical hour (60 minutes) is allocated for solving the tasks of the qualifying stage of the Olympiad. The countdown starts from the moment the tasks start. The place and time of the tasks are determined by the participants themselves. To complete the tasks, a computer with Internet access is needed. The Organizing Committee is not responsible for power and communication failures at the time of solving the tasks of the qualifying round.

The participant of the Olympiad completes the tasks of the qualifying stage once. The tasks of the qualifying stage include __ blocks of questions. For each correct answer of 1 block, the participant receives _ points; for each correct answer of 2 blocks, _ points. The maximum possible number of points scored by a participant is 100.

The Olympiad tasks of the qualifying round include content elements from the following sections (topics) of the courses 35.03.06 Agroengineering (program "Technical service in the agro–industrial complex"):

- section "Reliability of technical systems in the agro-industrial complex";
- section "Diagnostics and maintenance of agricultural machinery";
- section "Agricultural machinery repair technologies";
- section "Fundamentals of scientific research";

To design the variants of the Olympiad work of the qualifying stage, various ways of presenting information in the task texts (graphs, tables, diagrams and schematic drawings) were used.

The first block contains 20 tasks. The tasks test the knowledge of key concepts in the field of operation, reliability and repair of equipment.

The second block contains 30 tasks. These are test tasks focused on technical diagnostic methods and tools, with a particular focus on engine diagnostics and electronic control systems.

The third block contains 10 tasks. This module tests the knowledge of specific technological processes, materials and modes used in the repair of agricultural machinery. Unlike the previous blocks, the focus here is shifted from diagnostics and general concepts to the practical execution of repair operations.

The fourth block contains 12 tasks. This module tests the assimilation of fundamental concepts, methods and terminology used in the organization and conduct of scientific research. It is methodological in nature and is basic for any scientific research activity, including in the agroengineering field.

The participant of the Olympiad receives an individual version of the Olympiad work of the qualifying stage, consisting of ___ questions: _____ tasks (tasks) from the first block of tasks, _____ tasks (tasks) from the second block, etc. (as an option).

Each task is evaluated depending on the difficulty level and the correctness of the result obtained. The points received by the participant of the Olympiad for completed tasks are summed up.

THE LIST OF CONTENT ELEMENTS INCLUDED IN THE TASKS OF THE OLYMPIAD OF THE QUALIFYING STAGE OF THE 2025/2026 ACADEMIC YEAR

SECTION 1. Reliability of technical systems in the agro-industrial complex

The tasks can be divided into several thematic groups:

Quality and reliability: Define the understanding of the fundamental concepts of "repair quality", "labor quality" and their interrelation with reliability indicators and economic costs.

The impact of resource and maintainability: Assess knowledge of the economic and operational consequences of changing a machine's resource and maintainability.

Classification of failures: The assimilation of various types of technical failures is checked for reasons of occurrence (structural, production, operational), by interrelation (independent, dependent) and by the nature of the manifestation (intermittent, gradual).

Repair and maintenance organization: They relate to the practical aspects of maintenance planning and understanding of technological documentation (rationing chart).

The assignments are presented in the format of a closed multiple-choice test (options A, B, C). In most questions, only one answer is correct.

The main goal is to test the assimilation of terminology and understanding of the principles of ensuring reliability, efficiency and cost—effectiveness of operation of lifting and loading equipment in the agro-industrial complex.

The tasks are of an applied nature and require not just mechanical memorization of definitions, but an understanding of cause-and-effect relationships in the processes of operation and repair. The difficulty level can be described as average for a specialized technical module.

SECTION 2. Diagnostics and maintenance of agricultural machinery

The tasks can be clearly divided into three main thematic groups:

Methods of engine diagnostics: Check the knowledge of non-braking and braking methods, their physical nature and practical application (for example, the use of a pneumatic tester to check the tightness of cylinders).

Diagnostics of electronic systems: The most extensive part of the test. It covers the types of diagnostic codes (slow, fast), international standards (OBD, OBD-II), their origin and key concepts (error codes, MIL, ISO, SAE).

Organization of diagnostics: It concerns the goals and objectives of a specific type of diagnostics (D-2) in the general maintenance system.

The assignments are presented in the format of a closed multiple-choice test (options A, B, C). In most questions, only one answer is correct.

The main goal is to evaluate the knowledge of modern diagnostic technologies that combine both classical mechanical methods (brake tests, pneumatic tests) and advanced methods of computer diagnostics of electronic systems.

The difficulty level can be described as average and above average. Successful implementation requires not only memorizing terms, but also understanding the principles of diagnostic equipment and standardized data exchange protocols (for example, the difference between OBD-I and OBD-II). Questions about codes and standards require specific, highly professional knowledge.

SECTION 3. Agricultural machinery repair technologies

The assignments cover a wide range of repair technologies, which can be grouped into the following areas:

Restorative and strengthening technologies.:

Straightening and deformation: The subtleties of plastic deformation are considered: the disadvantages of cold straightening, the amount of effort required, and ways to ensure high quality.

Surfacing and spraying: Knowledge is tested on the choice of equipment (type of plasma torch) and materials (material of an electromechanical processing tool) for specific recovery methods.

Painting and surface preparation:

The parameters of airless painting are considered in detail: the temperature of the material and the operating pressure in the system.

The knowledge of the correct technology for preparing a suitable surface is checked, which is critically important for the durability of the coating.

Running-in of repaired equipment: Concerns the final stage of repair, checking knowledge of the basic requirement for running-in of parts.

Organizational and technological repair methods: Checks the understanding of non-standard but effective methods of restoring working capacity without complex repairs (for example, the "new work position" method).

Closed-type tasks with multiple choice predominate. However, in this block there are questions with one answer option out of five (D, E), which

increases the complexity. The questions require precise knowledge of numbers, parameters, and specific grades of materials.

SECTION 4. Fundamentals of scientific research

The tasks can be divided into several key topics:

Basic concepts and stages of research: Define the understanding of the essence of scientific research, its structure and the sequence of stages (from problem formulation to the formulation of hypotheses and conclusions).

Research methods: They test knowledge of classical methods of primary data collection (observation, experiment) and forecasting methods (extrapolation).

Mathematical and statistical data processing: The most extensive and difficult part of the test. It covers:

Types of measuring scales (nominal).

Experimental planning methods (randomization).

Statistical criteria and coefficients (Student's criterion, coefficient of concordance, coefficient of variation).

Specific terminology (related ranks).

Experiment planning: Verifies knowledge of the key procedure for organizing scientific research.

The block contains two formats:

Closed multiple choice questions.

Open questions where you need to enter a term or concept.

The purpose is to assess the students' scientific thinking and understanding of the methodological apparatus of research.

Literature for preparation:

1. Full name, title, output data.
2. Full name, title, output data.