

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ  
РОССИЙСКОЙ ФЕДЕРАЦИИ

Федеральное государственное автономное образовательное учреждение  
высшего образования

«Казанский (Приволжский) федеральный университет»

Институт информационных технологий и интеллектуальных систем

УТВЕРЖДАЮ

Проректор  
по образовательной деятельности

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“ 28 ” 10 2024г.



**ПРОГРАММА ВСТУПИТЕЛЬНОГО ИСПЫТАНИЯ**

Направление подготовки: 09.04.04 «Программная инженерия»

Профиль обучения: Искусственный интеллект в разработке цифровых продуктов (с применением электронного обучения и дистанционных образовательных технологий)

(программа реализуется на английском языке)

Форма обучения: очная

**THE PROGRAM OF THE ENTRANCE TEST**

Course of study: 09.04.04 "Software engineering"

Profile: Artificial Intelligence in Digital Product Development (with the use of e-learning and distance education technologies (the program is implemented in English with the use of distance technologies)

Form of study: full-time

## Лист согласования программы вступительного испытания

Разработчик(и) программы:

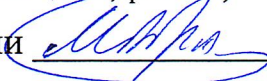
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М.М.Абрамский

(должность, инициалы, фамилия)

Председатель экзаменационной комиссии



М.М.Абрамский

(подпись) (инициалы, фамилия)

Программа вступительного испытания обсуждена и одобрена на заседании кафедры цифровой аналитики и технологий искусственного интеллекта Института ИТИС

Протокол № 1 от «2» сентября 2024 г.

Решением Учебно-методической комиссии Института ИТИС Программа вступительного испытания рекомендована к утверждению Ученым советом

Протокол №5 от «25» сентября 2024 г.

Программа вступительного испытания утверждена на заседании Ученого совета Института ИТИС , Протокол № 2 от «26» сентября 2024 г.

## Content

1. Introductory part	4
2. Program content	5
3. Assessment Fund and examination tasks	7
4. List of information sources for preparation for entrance tests	10
Appendix 1. Form of the examination sheet	11



# 1. INTRODUCTORY PART

## 1.1. Purpose and objectives of entrance examinations

The purpose of the entrance test is to determine the readiness and ability of a person entering the magistracy to master the chosen master's program.

The main objectives of the entrance examination: to check and evaluate the level of knowledge and skills of the applicant; determine the propensity for research activities; define the scope of scientific interests.

## 1.2. General requirements for the organization of entrance examinations

Persons with higher education of any level, confirmed by a document on higher education and qualifications, are allowed to pass the entrance test to the magistracy. Entrance examinations for applicants to the magistracy include two parts: **a written work and a portfolio**.

## 1.3. General forms of entrance examinations

### Forms of writing work

- full-time, when the applicant comes to the classroom according to the schedule and completes tasks on the form (the form of the ticket is in Appendix 1).
- remote, using the proctoring system through the applicant's personal account on the website [abiturient.kpfu.ru](http://abiturient.kpfu.ru), the written work takes place in the form of testing and a detailed answer to questions.

## 1.4. Duration of entrance examinations in minutes

The duration of written work on tickets is 3 hours (180 minutes).

The examination in full-time and remote form is held on the same day.

## 1.5. The structure of entrance examinations

1.5.1. **Written examination** in full-time is conducted by tickets. Each ticket contains 2 groups of questions: on the basics of programming and IT and on working with data and an introduction to artificial intelligence (AI) technologies.

### Notes on the remote format of entrance examinations:

The first part of the "Fundamentals of Programming and IT" written work comes in a test format. Answers to tasks are either choosing one option from several or entering a set of characters that should be written in the "answer" field after the question - without spaces, commas and other additional characters and click the "next" button. ATTENTION: If you do not know the answer to the specified question and press the "next" button, it will no longer be possible to return to the unanswered question.

The second part "Working with data and an introduction to AI technologies" of the written work requires a detailed solution. You are downloading the answer sheet. Fill it out on a computer, then save it in .pdf format and name it "Your full name is Artificial Intelligence", then attach it as an attachment to the system for the exam, and also send it to [se.master@it.kfu.ru](mailto:se.master@it.kfu.ru). In the subject of the letter, please indicate the

last name, first name and patronymic. If you do not answer the second part, then you attach a blank form and click on the "next" button.

1.5.2. The **portfolio** must be prepared in advance and brought in a printed form to the exam (when taking the exam in full-time format), or sent before the exam to [se.master@it.kfu.ru](mailto:se.master@it.kfu.ru). (in case of remote examination). In the subject of the letter it is necessary to indicate the last name, first name and patronymic, in the text of the letter list the items of the portfolio. If the size of the sent files exceeds 10 MB, you should use links to cloud services (Google Drive, Yandex.disk, Cloud Mail, Dropbox, etc.)

## 2. PROGRAM CONTENT

### 1.1. A WRITTEN EXAM

The written exam consists of two parts: answers to 15 basic questions on the topic "Fundamentals of programming and IT", and detailed answers to 4 questions on the topic "Working with data and an introduction to AI technologies". Lists of questions to prepare for the written exam are given in section 3.

#### a. Fundamentals of programming and IT

The applicant is asked to answer 15 questions on programming and IT (each correct answer is worth 3 points). When answering, it is allowed to rely on one or more programming languages from the list: Pascal, C ++, C #, Java, Python:

Topics:

1. Data types, their storage and presentation. Arithmetic and logical operations.
2. Conditional and cyclic operators of the language.
3. Basic data processing algorithms
4. Arrays, actions with them.
5. Symbols and lines.
6. Functions, procedures, methods.
7. HTTP protocol. URL, URI. POST and GET requests. Request options.

Response.

8. HTML, HTML forms. Static and dynamic sites.
9. Object-oriented programming. OOP principles - abstraction, 3 pillars of OOP (encapsulation, inheritance, polymorphism), classes and objects.

*The maximum possible score for part a is 45 points.*

#### b. Working with data and an introduction to AI technologies

The applicant is invited to answer in detail 4 questions on knowledge of computer science and information technology in general. Each is worth 10 points.

Topics:

1. Data representation models, architecture and basic functions of the DBMS.
2. Relational databases. ER diagrams. ORM model.
3. Creating tables and executing SELECT queries in SQL
4. Object-oriented programming. OOP principles - abstraction, 3 pillars of OOP (encapsulation, inheritance, polymorphism), classes and objects.
5. Models, methods and technologies of artificial intelligence (overview) - purpose, cases, existing popular methods and technologies.



*The maximum possible score for part b is 40 points.*

*The maximum score for the written exam is 85 points.*

## **1.2. PORTFOLIO**

A portfolio is not a mandatory part of the entrance examinations, however, its presence makes it possible to obtain up to 15 points in addition to the results of the written exam. The applicant brings a pre-prepared and printed Portfolio (with confirmation) to the exam. Portfolio evaluation is carried out on the day of the exam; at the same time, the presence of the applicant is recommended, because during the analysis of the portfolio, clarifying questions on the written exam can be discussed. Points are counted only if there is confirmation of the portfolio components.

An applicant's portfolio may include:

### **a. Availability of publications**

- 10 points for having at least one publication in the core area of study in the master's program (in Scopus or Web of Science journals),
- 7 points for the presence of a publication from the VAK list
- 5 points for publication in a journal from the RSCI list (conference abstracts do not count)

Confirmation: either the publication itself, or notification of acceptance of the article for publication. Points are given for the presence of publications, their number is unprincipled. If there is a publication of a higher level, points for a lower level are not awarded.

### **b. The manifestation of research activity during the years of study:**

- participation in scientific conferences (must be confirmed by abstracts / publications) - up to 3 points, depending on the level of the conference;
- participation in student olympiads (diplomas / diplomas) - up to 3 points, depending on the place taken;
- the presence of nominal scholarships (certificates) - up to 3 points - depending on the level of the scholarship;

*The maximum number of points for a portfolio is 15 points*

### 3. VALUATION FUND

#### 3.1. Work instructions

According to the results of the entrance test, the applicant gains a certain number of points. The minimum score for obtaining a positive assessment in the entrance examinations to the master's program is 40 points. The maximum mark on the results of the entrance examination is 100 points

When evaluating the answer, the content completeness of the answer, understanding and awareness of the material presented in the answer are taken into account. The answer to the entrance test to the magistracy should be clear, specific, and as complete as possible.

The response of the applicant to the master's program is evaluated according to the following scale of points.

Topic	Number of questions	Maximum score
Fundamentals of programming and IT	15	45 (3 points per question)
Working with data and an introduction to AI technologies	4	40 (10 points per question)
Portfolio		15
TOTAL		100

Maximum Points	100
The entrance test is considered passed if the applicant scored more than	40 and above
The entrance test is considered NOT passed if the applicant scored	39 and below

In case of equal scores, priority is given to the highest score for the written part of the work. In case of equality of points for the written part of the work, the priority is considered according to the assessment for the part "Information Technology" of the written part.

#### 3.2. Sample tasks

##### Fundamentals of programming and IT

1. What is the given expression in C+ / C# / Java:  $100 \gg 3$  ?
2. What is the given expression in C+ / C# / Java languages:  $++c+a++$  if initially  $c = 10$ ,  $a = 5$  ?
3. How can the number 10100 in binary be written in hexadecimal?
4. What decimal number corresponds to the binary number 10001?

5. A loop with a precondition is a loop with a keyword:
  - a.while
  - b.do
  - c.repeat
  - d.foreach
6. What parts does HTTP-response consist of? What do they contain? What is a MIME type? Decode MIME, give 2 examples.

### **Working with data and an introduction to AI technologies**

1. Select at least 7 entities (Entities) in an arbitrary application that can be stored in the database. Specify at least 7 fields for them (not including ID) with their data types. Relationships between table keys must be demonstrated. Intermediate tables are not considered to be entities.
2. Describe the principles of abstraction and polymorphism in object-oriented programming. Specify the main features of polymorphism.
3. What is inheritance? Why is it needed in object-oriented programming. Give an example of inheritance that reflects its key features (code in any language / UML diagram)
4. What is polymorphism? Why is it needed in object-oriented programming. Give an example of polymorphism (code in any language/UML diagram)
5. Give 2 cases of using artificial intelligence technologies/methods/systems in medicine. Describe which model/method/technology is being used. Why was the problem not solved before the use of AI?
6. How do you understand the term knowledge? How can knowledge be stored? Give an arbitrary example of a way to store knowledge.



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Форма экзаменационного листа для очной формы вступительного испытания

**Экзаменационный лист поступающего в магистратуру  
Института ИГИС, 2023-2024 уч.год**

*Профиль: «Методы и инструменты искусственного интеллекта в разработке программного обеспечения»*

ФИО \_\_\_\_\_

**1. Основы программирования**

*Задания и место для ответов*

**2. Работа с данными и введение в технологии ИИ**

*Задания и место для ответов*