Al-FARABI KAZAKH NATIONAL UNIVERSITY

APPROVED

Vice Rector for Academic Affairs
Khikmetov A.K.
«___»_____ 2020.

ENTRANCE EXAMINATION PROGRAM FOR APPLICANTS TO PhD IN THE SPECIALTY OF 8D01502 -INFORMATICS

ALMATY 2020

The program is compiled in accordance with the State educational standard in the specialty "8D01502-Informatics." The program was compiled by d.p.sc., professor Kerimbayev N.N.

The program was considered at a meeting of the Department of Informatics
Minutes №31 dated April 15, 2020

Head of department_____ Imankulov T.S.

Approved at a meeting by the Bureau of the Faculty of Information Technology
Minutes №8 dated April 21, 2020

Chairman of the Methodological Bureau _____ Gussmanova F.R.

Approved at a meeting of the Academic Council of the faculty
Minutes №21 dated April 24, 2020

Chairman of the Scientific Council
Dean of the Faculty _____ Urmashev B.A.

Scientific Secretary _____ Sambetbayeva A.

CONTENT

1. Goals and objectives of the entrance exam in the specialty

1.1. The purpose of the entrance exam in the specialty

The entrance qualification exam in the specialty "8D01502-Informatics" is a form of entrance control for admission to doctoral PhD. The purpose of the entrance control is to assess the quality of professional training of a specialist and to identify among applicants in doctoral studies in the specialty "8D01502-Informatics" the level of scientific and professional knowledge and skills in the field of computer science and computerization of education (research and development, design, production and technological; educational).

1.2. Objectives of the entrance exam in the specialty

During the exam revealed:

- in-depth theoretical and practical training in the chosen direction of science and pedagogical activity;
- the skills of organizing and conducting research, the necessary reserve for the continuation of scientific work in doctoral studies;
- knowledge of modern technologies in the field of informatics and informatization of education;
- skills in creating modern technologies in the field of informatics and informatization of education;
- competencies in the field of computer science and related fields.

2. Requirements for the level of training of people entering PhD doctoral studies

An applicant entering PhD doctoral studies in the specialty “8D01502-Informatics” must have fundamental scientific and professional training, be familiar with modern technologies in the field of informatics and informatization of education, be able to solve educational problems and use active teaching methods in the field of informatics and informatization of education, plan and conduct research / experimental research activities in the chosen scientific specialty, it is desirable to have experience in teaching at universities, successfully carry out research and management activities, speak a foreign language. An international certificate of language proficiency is required.

3. Prerequisites for the educational program

Informatization of education and learning problems.

4. List of Exam Topics

Discipline "Informatization of education and learning problems"

Education Informatization

Introduction to Education Informatization

The concept of informatization. The purpose and objectives of the informatization process. Factors affecting the process of informatization. The main directions of informatization of society. Stages of development of informatization of society. Positive and negative aspects of informatization of society.

The concept of informatization of education. Factors affecting the informatization of education. Informatization of education and society. The main directions of informatization of education. Stages of development of informatization of education.

The purpose and objectives of informatization of education. Place of informatization of education. Formation of informatization of education in the Republic of Kazakhstan and abroad.

The impact of informatization on the teaching system. Teaching abilities of a modern computer, information and communication technologies.

Psychological and pedagogical foundations of informatization of education. Psychological and pedagogical theories underlying the computerization and informatization of education. The concept of information culture. Components of information culture.

Information approach to building a learning model. Informatization of education as a direction of scientific research, scientific-pedagogical and scientific-methodical research. Informatization of education as a direction of teacher training.

Information educational environment and information educational space

The concept of information educational environment and its components. Features of training in an information educational environment.

Information educational space and its components. Features of training in the conditions of information educational space. Information educational space as a system of information educational environments.

Technologies and means of informatization of education

The concept of education informatization technology. Classification of educational informatization technologies.

Information Technology. Telecommunication technologies.

Information technology for input and output of information, storage and presentation of information transfer. Hypertext and hypermedia technologies. Multimedia technology. Intranet / Internet / Extranet technology in education. Distance Learning Technologies. Information modeling technology and virtual reality.

Personality-oriented education informatization technologies. Information-developing technologies of informatization of education.

Informatization methods in training. Project Method The method of telecommunication project. Information resource method. Teleconference Method. Intranet / Internet / Extranet technology methods. The method of information modeling.

The penetration of informatization methods in personality-oriented learning, in developing learning.

Factors affecting the rationale and choice of technology and methods of informatization.

Methods of informatization of educational activities

Information and telecommunication technologies in the educational process. Informatization of control and measurement of learning outcomes. Informatization of extracurricular activities, scientific and methodological research.

Methods of informatization of organizational and managerial activities. Calculation, planning and administration of educational activities in the context of informatization of education. Application of Intranet / Internet / Extranet technologies in the management of educational organizations.

Educational Informatization Tools

The concept of means of informatization of education and their classification.

Technical means of informatization of education. The technical base and the basic basic means of informatization of education. Stages of implementation of technical means of informatization in education. Classification of technical means of informatization of education.

Telecommunication facilities and their classification. Multimedia Tools. Organization of Intranet / Internet / Extranet networks in education. Organization of distance learning, open education and virtual institutions. Means of organizing interpersonal communication. Means of informatization of control and measurement of learning outcomes.

Computer software and methodological support and its classification.

The concept of world information resources and their classification. The concept of educational information resources and their classification. Educational portals. Resources for distance learning, open education, and virtual institutions. Resources for organizing interpersonal communication. Social networks.

Information resources for monitoring and measuring learning outcomes. Information resources of extracurricular activities. Resources of scientific and methodological research.

Organizational and management resources. Possibilities of Intranet / Internet / Extranet technologies in the management of educational information resources. The use of "clouds" and data centers.

Factors affecting the rationale and choice of technical means of informatization of education and educational information resources.

The concept of electronic publications and their classification. The concept of educational electronic publications and their classification. The composition of the educational electronic publication. Areas of use of educational electronic publications and resources.

Approaches to the presentation of the content of educational electronic publications and resources. Tools for creating educational electronic publications and resources. Stages of design and development of educational electronic publications. The interface of educational electronic publications and its classification. Assessment of the quality of educational electronic publications and resources.

Training of teachers in the conditions of informatization of education

Competencies presented to teachers in the conditions of informatization of education. Factors of formation of teachers' readiness to use technologies, methods and means of informatization of education. The system of training teachers in the field of education informatization.

Learning problems

Presentation and coding of information using sign systems. Number systems and computer representation of information. Information encoding methods. Language as a form of presentation of information (natural and formal languages). The main logical nodes of the computer: encoders, decoder, adder, multiplexers and demultiplexers. A graphical representation of logical nodes and their truth tables. Methods of studying logical elements using the example of bit strings (based on the example of 8-bit).

Stages and trends in the development of technical means and information resources. The architecture of modern computers. Basic computer devices: functions and the modular-backbone principle of building a computer. The main directions and conditions of studying the architecture of modern computers in universities.

Basic concepts of information technology. Historical background of the development of information technology. The methodology of using information technology in the educational process.

The main directions of software development for modern computers. Software classification. The variety of operating systems. Server operating systems. Problems of introducing modern software into the educational process.

Definition and structure of computer networks. Prospects for the development of local and global computer networks. Advantages and disadvantages of types of network topologies. Problems speeding up loading web pages and saving traffic

A complex of hardware and software for organizing computer networks. Internet addressing system. Client server architecture. The main Internet services: e-mail, chat, newsgroups, forums and methods of their use in the educational process. Competition as a factor in the development

of information retrieval systems. Methodology and stages of implementation of computer networks in the educational process.

Characterization of probabilistic and alphabetic approaches to measuring information. Information transfer rate. Data transfer medium. Methods to increase the bandwidth of the communication channel.

Wireless technologies and the main directions of their development. Problems and prospects of development of network technologies, hardware, protocols, operating systems and their use in the educational process of the university. Educational network systems.

Scientific and theoretical foundations of the use of educational Internet resources. The effectiveness of using hypertext technologies in education. Web site technology. The use of these technologies and methods for their study in the educational process.

Database. Modern database management systems. Data Organization Models. Relational data models. The integrity of relational data. The keys. Primary keys. Foreign keys. Universal keys. Methods of their study.

Relational data models. Relational data objects. Subject area. Relations. Relationship scheme. The concept of "entity-relationship." Projection. Attribute. Functional relationship between attributes. Domain Tuple. Examples of using relational data models in the educational process and methods of their training. Relational data models. Relational algebra The main operators of relational algebra. Computer implementation of relational algebra.

Database. Triggers: creation and application. The definition of a trigger. Implementation of triggers and examples of use in the management of the educational process. Database. Transactions Create and delete a transaction. Transaction management. An example of the use of a transaction in the management of the educational process.

Intelligent systems. The main directions of intelligent systems and their teaching in the educational process of the university. The structure of intelligent systems. Design and computer implementation of an intelligent system.

Expert systems. The main advantage and purpose of expert systems. Areas of application of expert systems. The knowledge base of expert systems. Educational expert systems.

Algorithmization and programming basics. Algorithms Data types. The physical implementation of data types in a computer system. Structures Computer implementation of structures. The operators. Methods of their operators. Linear programming. Nonlinear programming. Dynamic programming. Methods of their study in the educational process of the university.

Computer modelling. Process modeling. The main stages of computer simulation.

Informational resources. Educational information resources. Information ethics and law, information security. Data protection. Legal and pedagogical side of the implementation of information security.

Information Security. Security threats, methods and means of information protection. Computer viruses: definition and classification. Protection against computer viruses. Legal and pedagogical state of computer virus learning. Cryptographic methods of protection. The history of cryptography. Basic concepts and definitions. Requirements for cryptographic systems. Encryption algorithms. Methods of their study.

Educational robots. Fundamentals of the introduction of robotic tools in education. Types of educational robots. Educational robots software. The introduction of robots in the educational process of schools and universities.

Distributed data. The main tasks of distributed data management systems. Use of distributed data in education.

The concept of open systems. Clients and servers of local area networks. System architecture "client-server". Database servers. Database Clients The use of this technology in the organization of the educational process. Grid technology. Basic concepts. Grid concept. Features of grid technology. Types of grid systems. Problems of introducing grid technology in the educational process.

Basics of cloud technology. Cloud computing as a new way to provide computing resources. Cloud structures. Types of clouds. Using cloud technology resources in education.
Parallel computing. Basic concepts of parallel computing. The implementation environment of parallel computing. Promising areas of high-speed computing. The state of the study of parallel computing in the educational process of the university.
Basic concepts of supercomputers. The history of the formation of supercomputers. The state of use in the educational process.

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Answer Evaluation Criteria

The ticket includes 6 questions. Each question in each discipline is estimated at 16-17%. The total amount for 6 questions is 100%.
Grade Scale

A	95-100%	Excellent
A-	90-94	
B+	85-89	Good
B	80-84	
B-	75-79	
C+	70-74	Satisfactory
C	65-69	
C-	60-64	

D+	55-59	
D	50-54	
F	0-49	Not satisfactory

The answer of the doctoral candidate is assessed as “excellent” when he demonstrates a complete understanding of the fundamental principles of computer science, the main achievements and trends in the development of modern computer science and the computerization of education, technology of professional and scientific activities. Able to clearly, clearly and logically express their thoughts in writing and speaking; knows how to apply the acquired knowledge to solving practical problems; demonstrates the ability to reason and draw logical conclusions.

The answer of the doctoral candidate is assessed as “good” when he demonstrates a significant understanding of the fundamental foundations of computer science and the computerization of education, the main achievements and development trends of modern computer science, technology of professional and scientific activities. Able to clearly, clearly and logically express their thoughts in writing and speaking; knows how to apply the acquired knowledge to solving practical problems; demonstrates the ability to reason and draw logical conclusions.

The answer of the doctoral candidate is assessed as "satisfactory" when the answer indicates a limited understanding of the fundamental foundations of computer science and the computerization of education, the main achievements and development trends of modern computer science, technology of professional and scientific activities. Does not know how to clearly, clearly and logically express his thoughts in writing and speaking; Does not fully apply the acquired knowledge to solving practical problems; demonstrates a partial ability to reason and draw logical conclusions.

The doctoral candidate’s answer is assessed as “not satisfactory” when the answer indicates a complete lack of understanding of the fundamental principles of computer science, the main achievements and trends in the development of modern computer science and the computerization of education, technology of professional and scientific activity. Does not know how to clearly, clearly and logically express his thoughts in writing and speaking; Does not know how to apply the acquired knowledge to solving practical problems; demonstrates inability to reason and draw logical conclusions.