AL-FARABI KAZAKH NATIONAL UNIVERSITY

FACULTY OF INFORMATION TECHNOLOGIES

**ENTRANCE EXAM PROGRAM
FOR APPLICANTS TO THE PhD PROGRAM IN THE SPECIALTY
"8D06101-Information systems"
(for 3 years.)**

ALMATY 2020

The program is compiled in accordance with the State educational standard for the specialty "8D06101–Information systems". The program was compiled with acting Professor Baisholanova K. S.

The program was reviewed at the meeting of the Department of Information systems
Protocol № _____ "_____" _____ 2020y.

Head of Department _____ Mussiraliyeva Sh. Zh.

Approved at the meeting of the method Bureau of the faculty of information technology
Protocol № _____ "_____" _____ 2020y.

Chair method of the Bureau _____ Gusmanova F. R.

Approved at the meeting of the Academic Council
Protocol № _____ "_____" _____ 2020y.
Chairman of the Academic Council,
Dean of the faculty _____ Urmashev B. A.

Academic Secretary   _____ Sambetbaeva A. K.

<div align="center">

THE CONTENTS OF THE PROGRAM

1. Goals and objectives of the entrance exam in the specialty
</div>

1.1. Purpose of the entrance exam in the specialty

The purpose of the entrance exam is to identify the level of theoretical training entering the doctoral program and form a personal recommendation for admission based on competitive participation.

The entrance exam program includes the following subjects: "Architecture of information systems", "Data management of information systems", "Decision support and management information systems".

1.2. Tasks of the entrance exam in the specialty

The exam identifies:

- The applicant's knowledge of the fundamental principles of computer science and information technology; the main achievements and trends in the development of modern computer science; technologies of professional and scientific activities; knowledge of the main provisions of professional and scientific ethics and their use in work.
- The ability to find, analyze and process scientific and technical, natural-scientific and General scientific information, leading it to a problem-solving form; to design and carry out their professional, scientific activities; to project their further professional development.
- Skills of independent research and research work; scientific project activities, solving standard scientific and professional tasks, correct and logical formalization of their thoughts in oral and written form.

<div align="center">

2. Requirements for the level of training of persons entering the doctoral program PhD
</div>

Previous education level:

academic master's degree in the following specialties:

6M070300 – Information Systems

6M100200 – Information Security Systems

6M060200 – Informatics

6M011100 – Computer Science

6M070200 – Automation and control

6M070400 – Computer Engineering and Software

6M060300 – Mechanics

6M070500 – Mathematical and computer modelling

6M060100 – Mathematica

6M071900 – Radio engineering, electronics and telecommunications

The applicant must have a state-issued document of the appropriate level of education.

The program of the entrance exam for applicants to the doctoral program in the field of training "8D06101 – Information systems" was developed at the Department "Information systems".

<div align="center">

3. Prerequisites educational programs
</div>

Prerequisites:

- Architecture of information systems
- Data management of IS
- Decision support and management IS

<div align="center">

4. List of exam topics

Discipline "Architecture of information systems»
</div>

1. Classification of information systems. Concept of IP architecture. Architecture of modern information applications. Information systems that use application servers. The impact of intranet technologies.
2. Problems of building is. Requirements for hardware that supports IP. General characteristics and classification of Case funds.
3. Functional components of information systems. Tasks of the IP component of various architectures.
4. Distributed systems. Technologies for building distributed systems. Evolution of distributed systems into service-oriented information systems.
5. Organizational processes when creating an IP. Standards and methods for developing is of various architectures. Profiles of open is. Organizational and technological problems of creating information system applications.
6. Technology user level. Selecting the user-level architecture.
7. Structure and architecture of corporate information systems.
8. business intelligence Systems and their construction: ETL and OLAP technologies.
9. Using design templates.
10. Technology-level data. Universal storage. UDA-based access components. Data warehouses and systems for rapid analytical processing.

The list of recommended literature

Main

1. Trutnev D. R. Architectures of information systems. Design basics. – Textbook. Saint Petersburg: ITMO research INSTITUTE, 2012. 66 p.
2. Gomaa H. Software modeling and design: UML, use cases, patterns, and software architectures. – Cambridge university press, 2011. – 578p.
3. Microsoft Corporation Analysis of requirements and creation of solution architecture based on Microsoft .NET-MCSD Training course (certification exam 70-300) / Translated from English - Moscow: Publishing and trading house "Russian edition", 2004. –416 pages.

Additional

1. Dubakov A. A. Proektirovanie informatsionnykh sistem: uchebnoe posobie [Designing information systems: a Textbook–, Tomsk: Tomsk Polytechnic University Press, 2011, 258 p.
2. L. Constantine, L. Lockwood software Development. Saint-Petersburg: Piter Publ., 2004.
3. Izbekov Yu., Petrov V. Information systems: Textbook for universities. 2nd ed., Saint Petersburg, 2005.
4. Vendrov A. M. software Design. – M.: finances and statistics, 2000.
5. Odintsovo I. Professional programming. System approach. Saint Petersburg: BHV-Petersburg, 2002.
6. P. Thorsteinson. Oberg R. Architecture .NET and programming in Visual C++, Moscow: Williams Publishing house, 2002.
7. X. Goma UML. Design of real-time systems, distributed and parallel applications: Translated from English-Moscow: DMK, 2002

Discipline " Data management of IS»

1. Designing relational databases using normalization. The concept of functional dependence. Infological modeling. The entity-relationship model. Switch to the relational data model. Principles of integrity support in a relational data model.
2. General concepts and definitions of data integrity. Concept of a view operation for creating views. Horizontal view. Vertical view. Concept of a view operation for creating views. Grouped views. Combined views.
3. Physical database models. File structures used for storing information in databases. Strategy for resolving conflicts with the area of concern. The organization's strategy for the free replacement. Index file. Inverted lists

4. DBMS in the client-server architecture. Client-server architecture. The concept of open systems. Clients and servers of local networks. Client-server system architecture. Database server. Database clients

5. Syntax query optimization. Simple logical transformations of queries. Converting queries with changing the order of relational operations. Performances. The creation and destruction of views. Operations for selecting from views. Updating views. What are views for? The definition of privilege. Privilege definition operators.

6. Security and authorization of access. Transaction processing. The concept of open systems. The main tasks of distributed database management systems. Overview of the life cycle of information systems.

7. The life cycle of the database application. Remedies. Backup and restore. Integrity support. Encryption.

8. Simple selection. The concept of excluding duplicates. Selection using the where keyword. Using comparison operators and using BETWEEN, using IN, and using LIKE.

9. Aggregation of data. SQL functions. Functions without using the phrase GROUP BY. Using the HAVING keyword.

The list of recommended literature
Main:

1. Boyko V. V., Savinkov V. M. Designing databases and information systems, Moscow: Finance and statistics, 1989.
2. Thomas Connolly, Carolyn Begg-Databases. Design, implementation and maintenance. Theory and practice 3rd edition, Moscow, Williams, 2003, 1440 pages
3. Rebecca M. Riordan-Fundamentals of relational databases. Basic course. Theory and practice. Moscow, Russian Edition, 2001, 384 pages
4. *Saukap Ron.* Fundamentals of Microsoft SQL Server 6.5. M.; " Russian edition*. 1998.
5. S. D. Kuznetsov. Databases: languages and models. Moscow, Binom, 2008
6. Mark Rivkin. The new version of the Oracle DBMS is Oracle 11g. Oracle Magazine-Russian edition (May-June 2007).

Additional:

1. Hoffman G., Khomonenko V. Delphi 6 in the original. Saint Petersburg, BHV, 2004.
2. Michelle Of Daimler. Microsoft SQL Server 2008. General information about the product.
3. S. D. Kuznetsov. Object-relational databases: past stage or undervalued features? Proceedings Of the Institute of system programming, vol. 13, part 2,Moscow, ISP RAS, 2007, pp. 115-140.
4. Sergey Kuznetsov. Major problems and current challenges in database research.

Discipline «Decision support and management IS»

1. Functions of decision-making. Basic requirements for the decision-making function. Organizational and technological aspects of solutions.
2. Models of decision making organizational systems. Decision theory. Decision-making in the management process. Three concepts.
3. The decision-making tasks. DM. The content of the decision-making problem for a group LPR. The sequence of choice of the decision-making process.
4. Individual choice of solutions. Three types of strategies. The criterion of maximum of a mean value (interval scale, ordinal scale).
5. Group decision-making choices. Problem statement. The principle of majority vote. The dictator's principle. The Cournot Principle. The Pareto Principle. The Principle Of Expansion.
6. Modeling in business. Perform a sensitivity analysis. The impact of changes in resource provision on solving linear programming problems.
7. Multi-Criteria choice of decision-making. The only solution to the multi-criteria selection procedure.

8. Problem of linear programming and introduction to game theory. Mixed strategy.
9. Equivalence of matrix games and linear programming problems.
10. Optimal order size (economical order size-EOQ). The level and the interval re-ordering. The model of an economical lot size.
11. Reasons for creating a system model of project management. System view of project management. Objects and subjects of management.
12. System view of project management. Project implementation management process. Control object. Concept and definition of the project. Characteristics of the project.
13. Type of project (by main areas of activity). Type of project (by the nature of the subject area). Project classification scheme.
14. Internal environment of the project. Project life cycle. Project phase. The subjects of management: the main project participants. Diagram of project participants.
15. Functional, design, matrix structure. Management process. Functional areas of project management.

The list of recommended literature
Main:
1. Chernorutskiy I. G. Methods of decision making-Saint Petersburg: BHV-Petersburg, 2005. - 311 p.
2. Tirelessly P. V. systems of support of decision-making. Experience of designing / / Monograph-Volgograd: VSTU. 2009. -127 p. (in Russian)
3. Volobueva O. p. Designing information support for information and control systems (ICS). Laboratory practice. Almaty: KazNTU, 2010. 123 p.

Additional:
1. Burkov V. N., Kondratev V. V. Mechanisms of functioning of organizational systems. Moscow: Nauka, 2011 (1991). 384 p.
2. Shikin E. V., Chkhartishvili A. G. Matematicheskie metody I modeli V upravlenii [Mathematical methods and models in management], Moscow: Delo, 2002, 440 p

SCALE OF ASSESSMENT OF EXAM RESULTS

The applicant's response is rated "excellent" when they demonstrate a complete understanding of the principles of building the IP architecture, the ability to use IP for making management decisions, methods and models of data management in IP, the main achievements and trends in the development of modern IT technology, technology of pedagogical and scientific activities. The applicant must clearly, clearly and logically Express their thoughts in writing and oral speech; be able to apply the knowledge gained to solving practical problems; reason and make logical conclusions.

The applicant's response is rated "good" when they demonstrate a significant understanding of the principles of building the IP architecture, the ability to use IP for making management decisions, methods and models of data management in IP, the main achievements and trends in the development of modern IT technology, technology of pedagogical and scientific activities. The applicant must be able to clearly, clearly and logically Express their thoughts in writing and oral speech; be able to apply the knowledge gained to solving practical problems; reason and make logical conclusions.

The applicant's response is rated "satisfactory" when the response indicates a limited understanding of the principles of building the IP architecture, limited ability to use IP for making managerial decisions, methods and models of data management in IP, limited understanding of the main achievements and trends in the development of modern IT technologies, technology of pedagogical and scientific activities. Does not know how to clearly, clearly and logically Express their thoughts in writing and oral speech; can apply the knowledge gained to solving practical problems; ability to reason and make logical conclusions.

The applicant's response is rated "unsatisfactory" when the response indicates a complete lack of understanding of the principles of building the IP architecture, the ability to use IP for making management decisions, methods and models for managing IP data, lack of understanding of the main achievements and trends in the development of modern IT technologies, technologies of pedagogical and scientific activities. Does not know how to clearly, clearly and logically Express their thoughts in writing and oral speech; does not know how to apply the knowledge gained to solving practical problems; inability to reason and make logical conclusions.