

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Budgetary Educational Institution of Higher Education
Togliatti State University



Vice Director of Admissions
of Togliatti State University

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2020

ENTRANCE EXAMINATION PROGRAMME

Information Science

1 GENERAL PROVISIONS

1.1 The entrance examination in information science is held by Togliatti State University.

1.2 The entrance examination is a 90 minutes test containing 30 questions.

1.3 The candidates' results of all entrance examinations are assessed using a 100-mark grading scale.

2 CONTENTS

2.1 Information and encoding

Matter, energy, and information as fundamental concepts of science. Information processes in biological, sociological and technological perspectives: acquisition, transmission, conversion and usage of information. Information processes in management.

Language as a means of representation of information. Encoding. Binary representation of information. Probabilistic approach to quantifying the amount of information. Basic units of information. Methods of quantification.

Candidates should be able to:

Apply various types of information models (schemes, maps, tables, charts, and formulae) to present and read data; encode and decode information; estimate the rate of information transmission at a given channel capacity; estimate the memory capacity necessary for storing graphic- and audio information; estimate the volume of information in a message.

2.2 Modelling and computer experiment

Modeling as a method of scientific knowledge. Material and information models. General types of data models (flat, hierarchical, or network models). Formalization of data. Mathematical models. Logical models. Computer-assisted building and analysis of information models from various subject fields.

Candidates should be able to:

Apply various types of information models (schemes, maps, tables, charts, and formulae) to present and read data.

2.3 Numeral systems

Numeral systems and binary representation of information in computer memory. Positional systems.

2.4 Logic and algorithms

Basic concepts and operations of formal logic. Logical expressions. Conversion of logical expressions. Generating truth tables of logical expressions. Logic circuits of basic computer units (adders and registers). Basic concepts and laws of mathematical logic.

Candidates should be able to:

Construct truth tables and logic circuits; create a linear algorithm for a formal executor with a limited set of instructions.

2.5 Elements of algorithm theory

The concept and basic properties of an algorithm. Execution of algorithms. Executive instructions. Means of writing algorithms. Formal execution of algorithms.

Candidates should be able to:

Analyze an algorithm with a cycle and a branch; analyze the result of an executed algorithm.

2.6 Programming

Programming paradigms (algorithmic, object-oriented, and logical programming). Basic programming language constructs. Variables. Assignment operators.

Candidates should be able to:

Explain how a recursive algorithm is executed; work with arrays (filling, reading, searching, sorting, bulk operations, etc.); analyze a program containing procedures and functions.

2.7 Computer and network architecture

Basic components of a computer, their functions and coordination. Modular bus architecture. Computer software. Operating system and its basic functions. Local and global computer information networks. General information resources: email, teleconferencing, file archives. Hypertext. Internet. WorldWideWeb technology. WWW publishing. Information search.

Data file management system.

Basic principles of computer networks and addressing organisation and operation.

2.8 Numerical information processing

Electronic tables and their key features. Editing of a table structure. Relative and absolute cell references. Number, formula, and text input. Standard table functions. Basic objects and operations of electronic tables (cells, worksheets, and workbooks). Creating charts. Using electronic tables for problem solving.

Technology of data processing in electronic tables and charts/graphs -based methods of data visualisation.

2.9 Technologies of information search and storage

Types of data bases. Relational (table type) data bases. Data base management system (DBMS). Record input and editing. Record search and sorting. Basic objects of data bases and operations (records and fields). Data base restructuring. Types and methods of data base queries.

Technology of information storage, search and sorting in data bases.

3 RECOMMENDED READING

1. Bits, Signals, and Packets: An Introduction to Digital Communications and Networks. Hari Balakrishnan, Christopher Terman, and George Verghese, MIT
URL: <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-02-introduction-to-eecs-ii-digital-communication-systems-fall-2012/readings/>
2. Information Theory, Inference, and Learning Algorithms. David MacKay, Cambridge
URL: <http://www.inference.org.uk/itprnn/book.html>
3. Philosophy of Computer Science by William J. Rapaport, University at Buffalo, The State University of New York
URL: <https://cse.buffalo.edu/~rapaport/Papers/phics.pdf>
4. How to Design Programs: An Introduction to Computing and Programming. Alfred Smith, Jason Glover, Matthew Flatt
URL: https://www.academia.edu/34228113/How_to_Design_Programs_An_Introduction_to_Computing_and_Programming
5. Programming Languages: Application and Interpretation. Shriram Krishnamurthi
URL: <http://cs.brown.edu/~sk/Publications/Books/ProgLangs/>
6. An Introduction to Computer Networks. Peter Lars Dordal, Loyola University of Chicago.
URL: <https://open.umn.edu/opentextbooks/textbooks/an-introduction-to-computer-networks>
7. Computer Networking : Principles, Protocols and Practice. Olivier Bonaventure, Universite catholique de Louvain
URL: <https://open.umn.edu/opentextbooks/textbooks/computer-networking-principles-protocols-and-practice>
8. Introduction to the Modeling and Analysis of Complex Systems. Hiroki Sayama, State University of New York at Binghamton
URL: <https://open.umn.edu/opentextbooks/textbooks/introduction-to-the-modeling-and-analysis-of-complex-systems>
9. Foundations of Computation. Carol Critchlow, Hobart and William Smith
URL: <https://open.umn.edu/opentextbooks/textbooks/foundations-of-computation>

перевод верен



О.В. Бицкова

начальник ОМС

ASSESSMENT

All entrance examinations arranged by Togliatti State University for candidates applying for a **bachelor's, specialist's, or master's degree**, have a maximum score of 100.

$$\text{Marks of the candidate} = \frac{\text{Number of correct answers}}{\text{Number of questions in the test session}} 100$$

where:

Marks of the candidate stands for the marks obtained by the candidate in the test session (a maximum of 100 marks);

Number of correct answers is the number of correct answers given by the candidate in the test session;

Number of questions in the test session is the number of tasks the candidate has to perform during the entrance examination according to the entrance examination programme.

The minimum passing score is specified by the entrance examination programme or/and by the university's internal regulations (List of entrance examinations stating the priority ranking of entrance examinations; on minimum admission score; on arrangement of entrance examinations held by Togliatti State University).