Ministry of Science and Higher Education of the Russian Federation

Federal State Budgetary Educational Institution of Higher Education

Togliatti State University

Approved by
Deputy Director of Admissions
of Togliatti State University
_____ E.S. Baboshina

« ___ » _____ 2021

**The program of the entrance examination
administered by TSU**

Computer Science and ICT

Togliatti, 2021

1. General Regulations

1.1. The entrance examination on computer science and ICT is a computer test.
1.2. The entrance examination is for 90 minutes.
1.3. The entrance examination is scored on a 100-point scale.

2. The Content of the Entrance Examination

2.1. Module 1. Information and the Coding of Information

The basic concepts of science (matter, energy, information). Information processes in nature, society and technical systems (acquisition, transmission, transformation and use of information). Information management processes.

Language as a way of presenting information. Coding systems. Binary code. Probability based approach to quantifying the amount of information. Units of information.

An examinee should be aware of methods for measuring the amount of information.

An examinee should be able to measure the amount of information in messages, to present and read data in information models (diagrams, maps, tables, graphs and formulas), to code and decode information, to calculate the information transfer rate for a given channel bandwidth and determine the required amount of memory for storage of audio and graphic information.

2.2. Module 2. Simulation and a Computer Experiment

Modeling as a method of cognition. Physical and information models. Different types of data models (tabular database model, hierarchical database model, network model). Formalisation. Mathematical models. Logical models. Computer based construction and study of information models from different fields.

An examinee should be able to present and read data in information models (diagrams, maps, tables, graphs and formulas).

2.3. Module 3. Numeral Systems

Numeral systems. The binary numeral system.
The positional numeral system.

2.4 Module 4. Logic and Algorithms

The basic concepts and basic operations of formal logic. Logical expressions and operators. Truth tables for logical expressions. Logic circuits of the basic computer devices (the adder, the register).

An examinee should be aware of the basic concepts and basic principles of mathematical logic.

An examinee should be able to build truth tables and logical connectives, to implement an algorithm written in natural language or to write a linear algorithm with a limited set of instructions for formal implementation.

2.5. Module 5. The Theory of Algorithms

The concept of an algorithm. The properties of an algorithm. Algorithm implementers, algorithm commands. The writing of an algorithm. The implementation of an algorithm. The basic constructs of an algorithm.

An examinee should be able to write an algorithm with a fixed set of instructions for a specific implementer.

The analysis of an algorithm containing a loop and selection. An examinee should be able to analyse the result of algorithm implementation.

2.6. Module 6. Computer Programming

Programming models and paradigms (algorithmic programming, object-oriented programming, logical programming). Operations on arrays (filling, reading, searching, sorting, massive use, etc.).

An examinee should be aware of the basic constructs of a programming language, the variable concept, the assignment operator.

An examinee should be able to implement a recursive algorithm and to analyse a program containing procedures and functions.

2.7. Module 7. The Architecture of Computers and Computer Networks

Basic functional units of a computer, the functions and the interrelation of the units. Modern computer architecture. Computer software. The purpose and functions of an operating system. Local and global computer information networks. Some of the main information resources (emails, teleconferences, file archives). Hypertext. The Internet. World Wide Web (www). Posting in www. The searching for information.

An examinee should be aware of a data file system, the basic principles of the organising and functioning of a computer network and the addressing in the network.

2.8. Module 8. Numerical Processing

The purpose and use of spreadsheets. The editing of a spreadsheet. An absolute reference and a relative reference to a cell. The input of numbers, formulas and words. Basic functions. Excel objects and operations on Excel objects (the cell, the sheet, the workbook). Plotting of diagrams. The use of spreadsheets to solve problems.

An examinee should be aware of how to process spreadsheet information and visualise data with diagrams and graphs.

2.9. Module 9. Data Search and Storing Technologies

Different types of databases. Relational tabular databases. A database management system (DBMS). The input and editing of data records. The sorting and searching for data records. Database objects and operations on database objects (the record, the field). Database restructuring. Types of queries and ways of organising queries.

An examinee should be aware of how to store, search and sort information in a database.

An examinee should be able to search for information on the Internet.

Program designers

| Department Head, Candidate of Pedagogical Sciences, Docent | O.M. Gushchina |
| *(Position, academic title, academic degree)* | *(Full name)* |

Associate Professor, Candidate of Pedagogical Sciences, Docent   E.V. Panyukova
(Position, academic title, academic degree)   *(Full name)*

Associate Professor, Candidate of Technical Sciences, Docent   N.V. Khripunov
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ASSESSMENT SCALE

Each of the entrance examinations administered by TSU and required for enrolment in any **Bachelor's program, Specialist's program or Master's program** is scored on a **100-point scale**.

$$\text{Test score in points} \ = \frac{\text{The examinee's raw score}}{\text{The number of test items}} \times 100,$$

where

Test score in points is the performance of an examinee on an entrance examination **(on a 100-point scale).**

The examinee's raw score is the number of correct answers an examinee gave in responding to the entrance test items.

The number of test items is the number of entrance test items for an examinee to complete.

The minimum score for successful completion of the entrance examination.