

**МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ ЕКОНОМІЧНИЙ УНІВЕРСИТЕТ
ІМЕНІ СЕМЕНА КУЗНЕЦЯ**

ЗАТВЕРДЖЕНО

на засіданні кафедри
інформаційних систем
Протокол № 1 від 27.08.2024 р.

ПОГОДЖЕНО

Проректор з навчально-методичної роботи



Каріна НЕМАШКАЛО

ХМАРНІ ОБЧИСЛЕННЯ

робоча програма навчальної дисципліни (РПНД)

Галузь знань	12 "Інформаційні технології"
Спеціальність	122 "Комп'ютерні науки"
Освітній рівень	другий (магістерський)
Освітня програма	"Комп'ютерні науки"

Статус дисципліни
Мова викладання, навчання та оцінювання

**обов'язкова
англійська**

Розробник:
д.т.н., професор

підписано КЕП

Сергій МІНУХІН

Завідувач кафедри
інформаційних систем

Дмитро БОНДАРЕНКО

Гарант програми

підписано КЕП

Сергій МІНУХІН

**Харків
2024**

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SIMON KUZNETS KHARKIV NATIONAL UNIVERSITY OF ECONOMICS

APPROVED

at the meeting of the department
information systems
Protocol No. 1 dated August 27, 2024

AGREED

Vice-rector for educational and methodical work

Karina NEMASHKALO



CLOUD COMPUTING

Program of the course

Field of knowledge	12 "Information technologies"
Specialty	122 "Computer Sciences"
Study cycle	second (master's)
Study programme	"Computer Sciences"

Discipline status

Language of teaching, learning and assessment

mandatory

English

Developer:

Doctor of Science, Professor

digital signature

Serhii MINUKHIN

Head of the department
information systems

Dmytro BONDARENKO

Head of Study Programme

digital signature

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Kharkiv

2024

INTRODUCTION

The conditions for the growth of data volumes and the increase in the dependence of the quality of the business processes of the commercial activity of enterprises on the flows and intensity of data lead to the need to create information systems that must ensure a sufficient level of development of technologies of distributed and parallel computing, as well as the availability of modern technologies for their distribution in various areas of business - activities of enterprises must ensure effective data processing in the mode of continuous provision of services. Significant changes and transformations in information systems to create convenient and high-speed tools for working with various data have a significant impact on this development.

The course "Cloud Computing" is studied by students of the specialty 122 "Computer Sciences" of the Educational and professional program "Computer Sciences" of all forms of education in the first year of study during the second semester. The study of the course involves the acquisition of theoretical knowledge and the mastery of practical skills related to the application of infrastructure solutions for the construction of distributed information systems, and trends that have influenced the emergence and development of the modern paradigm and concepts of cloud computing.

The purpose of teaching the course "Cloud computing" is to provide students with higher education with a system of theoretical knowledge regarding the standards of cloud platforms, their reflection in the technologies of leading cloud vendors; implementation models of cloud platforms for providing services; acquisition of practical skills in deploying and configuring cloud service software and mastering cloud technologies for working with applications, databases and data stores based on the latest information technologies.

The tasks of the course are:

- to ensure the understanding of the content and assimilation of cloud computing technologies by students of higher education, in particular, based on the standards of cloud systems and the main models of service provision;
- to know the application areas of cloud computing, and on their basis technologies for improving the productivity of the resource and computing environment of organizations and institutions;
- acquiring competences regarding the choice of a certain service model of the cloud platform architecture and the method of organizing the deployment of cloud computing systems,
- acquiring competences in working with cloud platform services, access, configuration tools and tools, their application for deploying applications and databases;

- acquiring practical skills in configuring and maintaining system and application software of cloud platforms, administration of applications and databases deployed in the cloud;

- acquiring practical skills in selecting and configuring software for creating and running applications and databases, in particular, big data, with further analysis of performance metrics of relevant cloud platform services;

- to know the pricing principles of various types of resources provided by cloud system service providers, the selection of optimal technical and economic parameters of a certain service when using cloud platforms, and decision-making based on public, private and hybrid clouds.

The object of the course is the processes of deployment, configuration and use of cloud platform services for launching applications and processing and analyzing data to improve the quality of management processes of enterprises and institutions.

The subject of the course is service models and deployment organization of cloud platforms for launching applications and creating and using databases.

The results of training and competence formed by the course are defined in the table. 1.

Table 1

Learning outcomes and competences formed by the course

Learning outcomes	Competencies that must be mastered by a student of higher education
LO1	SC08
LO2	SC05
LO4	SC09, SC12
LO5	SC04
LO6	GC07, SC07, SC08
LO7	GC01, GC03, SC01
LO8	SC06
LO9	SC02, SC12
LO10	GC07, SC02, SC09
LO11	SC12
LO12	GC01, GC02, GC03, GC05, GC07, SC02, SC05, SC07, SC08, SC09, SC11, SC12
LO19	SC12
LO 20	GC01, GC02, GC03, GC05, GC07, SC01, SC03, SC05, SC09, SC11, SC12

where, LO1. Have specialized conceptual knowledge that includes modern scientific achievements in the field of computer science and is the basis for original thinking and conducting research, critical understanding of problems in the field of computer science and at the border of fields of knowledge.

LO2. Have specialized computer science problem-solving skills necessary for conducting research and/or carrying out innovative activities in order to develop new knowledge and procedures.

LO4. Manage work processes in the field of information technology, which are complex, unpredictable and require new strategic approaches.

LO5. Evaluate the results of teams and collectives in the field of information technologies and ensure the effectiveness of their activities.

LO6. Develop a conceptual model of an information or computer system.

LO7. Develop and apply mathematical methods for the analysis of information models.

LO8. Develop mathematical models and data analysis methods (including large ones).

LO9. Develop algorithmic and software for data analysis (including large data).

LO10. To design architectural solutions of information and computer systems for various purposes.

LO11. Create new algorithms for solving problems in the field of computer science, evaluate their effectiveness and limitations on their application.

LO12. Design and support databases and knowledge

LO19. To analyze the current state and global trends in the development of computer sciences and information technologies.

LO 20. Develop algorithms and software components of computer information systems for high-performance big data processing systems (including distributed and parallel computing) and cloud platform services.

GC01. Ability to abstract thinking, analysis and synthesis.

GC02. Ability to apply knowledge in practical situations.

GC03. Ability to communicate in the national language both orally and in writing.

GC05. Ability to learn and master modern knowledge.

GC07. Ability to generate new ideas (creativity).

SC01. Awareness of the theoretical foundations of computer science.

SC02. The ability to formalize the subject area of a certain project in the form of an appropriate information model.

SC03. Ability to use mathematical methods to analyze formalized models of the subject area.

SC04. The ability to collect and analyze data (including large data) to ensure the quality of project decision-making.

SC05. Ability to develop, describe, analyze and optimize architectural solutions of information and computer systems for various purposes.

SC06. Ability to apply existing and develop new algorithms for solving problems in the field of computer science.

SC07. Ability to develop software according to formulated requirements, taking into account available resources and constraints.

SC08. The ability to develop and implement software development projects, including in unpredictable conditions, with unclear requirements and the need to apply new strategic approaches, use software tools to organize teamwork on the project.

SC09. Ability to develop and administer databases and knowledge bases.

SC11. Ability to initiate, plan and implement the development processes of information and computer systems and software, including its development, analysis, testing, system integration, implementation and support.

SC12. Ability to develop, apply and integrate data processing and analysis technologies in high-performance systems and cloud platforms to ensure efficient use of computing resources of computer systems.

COURSE PROGRAM

Content of the academic course

Content module 1. Basic concepts, standards, classification and technologies for building cloud platforms

Topic 1. Distributed information systems as systems for collective access and sharing of resources by order

1.1. The distributed system as a basis for the construction of distributed computer information systems for the joint use of information and communication resources. Computer systems for providing information and communication resources on order (grid systems).

1.2. Stages of development of distributed computer information systems based on methods of collective access to resources and their effective use to solve the problems of improving the quality of user service on demand.

Topic 2. Basic technologies and standards of cloud systems and technologies

2.1. Concept of virtualization of computer systems and networks. Types and levels of virtualization. Overview of virtualization systems of networks, resources, applications and data stores.

2.2. Definition of application and operating system level virtualization. Concept of virtualization of operating systems. Virtualization architecture with a hypervisor. Server virtualization (full virtualization and paravirtualization). Conversion of a server solution to a virtual machine, migration of virtual machines and "live migration". Software and hardware platform of server virtualization. Management of virtualization environments. Containerization and its application in cloud environments. Advantages of virtualization.

2.3. Virtual Private Cloud (VPC). Load balancing and CDN in cloud systems. Network policies and security of cloud platforms.

2.4. Reference model of information systems for cloud platforms (ISOT). NIST Cloud Reference Architecture. Appointment of Cloud Actors, Cloud Consumer and Cloud Provider. Architectures and principles of building cloud platforms of leading vendors.

2.5. A component model of a cloud solution.

Topic 3. Service models of cloud platforms

3.1. General characteristics of service models of cloud platforms. User and vendor functions: setting limits.

3.2. Characteristics and features of the IaaS cloud service model - information resources, data storage resources in the form of a service - computing, network

resources and data storage resources on demand for expanding your own hardware and software infrastructure and obtaining computing resources on demand.

3.3. Characteristics and features of the PaaS cloud service model. The possibility of running your own programs in the cloud.

3.4. Characteristics and features of the SaaS cloud service model.

3.5. Characteristics and features of the FaaS service model. Serverless computing: AWS Lambda, Google Cloud Function, Microsoft Azure Function. Purpose and functions of the model, conditions for use.

Topic 4. Deployment models of cloud platforms

4.1. Public Cloud: Available to any user or industry group.

4.2. Private Cloud (Private Cloud): operated for the needs of a specific organization. Community cloud: available to a group of organizations that support a certain communication. Community cloud architecture.

4.3. Hybrid Cloud: combines the functions of several clouds (public and private), which are separate clouds connected to each other, and to provide access to applications with the ability to transfer data and provide services.

Content module 2. Architecture, principles of operation and construction of modern cloud platforms

Topic 5. Microsoft Azure Cloud Platform.

5.1. Microsoft Azure cloud platform: implementation of PaaS and IaaS service models.

5.2. Composition and purpose of Microsoft Azure components: data storage services, calculations, interface. Composition and assignment of roles.

5.3. Types and characteristics of virtual machines: families and instances. The concept of an instance. Types and functionality of instances. Pricing of instances of virtual machines.

5.4. Management methods of virtual machines: web browser, Powershell, REST API.

5.5. Deployment for setting up services for working with applications and repositories and databases. Application of DevOps service for continuous integration and delivery when deploying applications and databases. Storage and database administration.

5.6. Overview of tools for machine learning and data analytics. Data modeling and visualization with Power BI. Preparation of Azure Data Factory, Azure Data Lake Storage and Azure Synapse Analytics. Create Stream Analytics tasks. Azure Stream Analytics solution templates. Monitoring tools in the cloud environment.

5.7. General principles of deployment, configuration and use of services on the Microsoft Azure platform.

5.8. The main areas of application of the platform for performing commercial tasks.

Topic 6. Amazon Web Services (AWS) Cloud Platform

6.1. Features of building the AWS platform (implementation of PaaS and IaaS service models). Composition and purpose of platform components: Amazon EC2,

Amazon RDS, Amazon EBS, Amazon EC2 Container Service (ECS), Amazon Simple Storage Service (Amazon S3), AWS Storage Gateway, Amazon Elastic MapReduce (Amazon EMR).

6.2. Types and characteristics of Amazon EC2 instances, EBS-optimized, ECS-optimized, compute-optimized, memory-optimized, accelerated compute-optimized, and HPC-optimized. Pricing of instances of virtual machines.

6.3. Amazon RDS: a service for configuring, using and scaling relational databases in the cloud: Amazon Aurora compatibility: with PostgreSQL; with MySQL; RDS for PostgreSQL, RDS for MySQL, RDS for MariaDB, RDS for MS SQL Server, RDS for Oracle and RDS and Db2.

6.4. The composition and purpose of components for analytics: big data processing (EMR); Amazon EMR Studio; Amazon Kinesis - analysis of video and data streams in real time; Amazon; QuickSight - fast business analytics service; predictive analytics and machine learning - AWS Deep Learning AMI images - deep learning on Amazon Elastic Compute Cloud (EC2).

6.5. Principles of operation of the Elastic MapReduce (EMR) service for deploying, configuring and using high-performance frameworks on the platform. Big data processing technologies using Amazon EMR Studio.

6.6. General principles of deployment, configuration and use of services on the AWS platform.

6.7. The main areas of application of the AWS platform for performing commercial tasks.

Topic 7. Cloud platform IBM Cloud

7.1. Characteristics and general concept of the IBM CLOUD platform. IBM Cloud Reference Architecture. Platform of PaaS and IaaS services to ensure service performance.

7.2. IBM Cloud Services IBM Cloud Computing Reference Architecture (CCRA) service delivery models. The composition and purpose of the main components of the model.

7.3. IBM Cloud instance types: Balanced, Compute, Memory, Variable Compute. Pricing of instances of virtual machines.

7.4. Common Cloud Management Platform component for managing platform services. IBM Turbonomic. Infrastructure-as-code (IaC) deployment management.

7.5. General principles of deployment, configuration and use of services on the IBM Cloud platform.

Topic 8. Google Cloud Platform (GCP)

8.1. Features of the platform. The main components and their purpose: data storage, machine learning, data analysis.

8.2. Types of virtual machines: General purpose — for general purpose; Storage — for data storage, without a high load on the processor; Calculations on processors — optimized for high load on processors; In-memory calculations are optimized for tasks that require a lot of RAM. Allows you to create instances with up to 12 TB of RAM; graphics and AI accelerators - allow the use of graphics accelerators (CUDA). Pricing of instances of virtual machines.

8.3. Compute Engine is an infrastructure-as-a-service that provides virtual machines.

8.4. App Engine is a platform as a service for hosting applications.

8.5. BigQuery is infrastructure-as-a-service that scales with analytics for databases.

8.6. BigTable is an infrastructure-as-a-service, scalable NoSQL database.

8.7. Cloud Datastore is a document-oriented cloud database.

8.8. Storage - infrastructure as a service, provides online REST access to files and contents of data stores.

8.9. Cloud AutoML is a set of machine learning products that allow developers with limited machine learning experience to use learning and neural network technologies.

8.10. General principles of deployment, configuration and use of services on the GCP platform.

Topic 9. General overview and directions of application of modern cloud platforms

9.1. Peculiarities of using cloud platform services in the business activities of enterprises and institutions, when deploying IT projects.

9.2. The main areas of application of cloud platforms to improve the quality of management of the activities of enterprises and institutions.

The list of laboratory classes by course is given in the table. 2.

Table 2

List of laboratory classes

Topic name	Content
Topic 1-6, 9.Laboratory work 1	Deploying ASP.NET web projects to Azure Application Service using Visual Studio"
Topic 1-6, 9.Laboratory work 2	Creating databases for an application on the Microsoft Azure platform
Topic 1-4, 6, 9.Laboratory work 3	Creating SQL databases on the Microsoft Azure platform
Topic 1-4, 6, 9.Laboratory work 4	Creation and deployment of web applications and databases using Microsoft Azure DEVOPS tools

The list of self-studies by course is given in the table. 3.

Table 3

List of self-studies

Topic name	Content
Topic 1 - 9	Studying lecture material
Topic 1 - 9	Preparation for laboratory classes
Topic 1 - 9	Preparation for the exam

The number of hours of lectures, laboratory classes and hours of independent work is given in the work plan (technological map) for the academic course.

TEACHING METHODS

During the teaching of the academic course, in order to acquire the specified learning results, to activate the educational process, it is envisaged to use such teaching methods as:

oral lectures (Topics 1–9), problematic lecture (Topics 7, 8), provocation lecture (Topic 8).

Visual (demonstration (Topics 1–9)).

Laboratory work (Topics 1 – 6, 9).

FORMS AND METHODS OF ASSESSMENT

The university uses a 100-point accumulative system for evaluating the learning outcomes of higher education applicants.

Current control is carried out during lectures and laboratory classes and is aimed at checking the level of readiness of a higher education applicant to perform specific work and is evaluated by the sum of points scored:

for courses with a form of semester control as an exam: maximum amount is 60 points; minimum amount required is 35 points.

Final control includes semester control and certification of the student of higher education.

Semester controls conducted in the form of a semester exam (exam). The semester exam (exam) is taken during the exam session.

The maximum number of points that a student of higher education can receive during the examination (examination) is 40 points. The minimum amount for which the exam is considered passed is 25 points.

The final grade in the course is determined:

– for disciplines with a form of exam, the final grade is the amount of all points received during the current control and the exam grade.

During the teaching of the academic discipline, the following control measures are used:

Current control: defense of laboratory work (50 points), written control work (10 points).

Semester control: exam (40 points).

More detailed information about the evaluation system is given in the work plan (technological map) for the academic course.

An example of an examination ticket and evaluation criteria for an academic course.

An example of an examination ticket

Semyon Kuznets Kharkiv National University of Economics

Second (master's) level

Specialty "Computer Sciences"

Educational and professional program "Computer sciences".

Semester 2

Course "Cloud computing"

EXAMINATION TICKET No. 1

Task 1 (diagnostic, 10 points). Specify the composition of the stack of service models of cloud technologies. Describe the SaaS model.

Task 2 (stereotypical, 10 points). Give the principles and scheme of organizing the use of Microsoft Azure cloud services. Purpose and functions of roles.

Task 3 (stereotypical, 10 points). List the components of the AWS platform. Describe the "Calculation" component.

Task 4 (heuristic, 10 points). List the composition of IBM service solutions for the cloud platform IBM Cloud.

Protocol No. 1 of August 27, 2024

was approved at the meeting of the Department of Information Systems.

Examiner, Doctor of Technical Sciences, prof. Serhii MINUKHIN

Head of department

Dmytro BONDARENKO

Evaluation criteria

The final marks for the exam consist of the sum of the marks for the completion of all tasks, rounded to a whole number according to the rules of mathematics.

The algorithm for solving each task includes separate stages that differ in complexity, time-consumingness, and importance for solving the task. Therefore, individual tasks and stages of their solution are evaluated separately from each other in this way.

Task 1.

This task is evaluated on a 10-point scale.

A score of 10 points is given if the acquirer provides a complete list of service models of the platform with the definition of functions. Their differences are given and detailed, the capabilities of the user and the service provider regarding the use of the SaaS model are justified and explained. A comprehensive description of the SaaS model is given.

A score of 9 points is given if the acquirer provides a complete list of service models of the platform with the definition of functions. Their differences are given, but the answer contains some inaccuracies in defining the differences between services of different levels. An almost exhaustive description of the SaaS model is presented.

A score of 8 points is given if the acquirer provides a complete list of service models of the platform with the definition of functions. Not all differences are given, the answer contains some inaccuracies in defining the differences between services of different levels. A sufficient description of the SaaS model is given.

A score of 7 points is given if the acquirer does not provide a complete list of service models of the platform with the definition of functions. Not all differences are given, the answer contains

certain inaccuracies in defining the differences between services of different levels. The characterization of the SaaS model is incomplete in terms of the division of functions between the user and the service provider.

A score of 6 points is given if the acquirer does not provide a complete list of service models of the platform with the definition of functions. Not all differences are given, the answer contains certain inaccuracies in defining the differences between services of different levels. The characteristics of the SaaS model are incomplete in terms of the distribution of functions between the user and the service provider, there are inaccuracies in defining the features of the SaaS model in terms of the distribution of functions between the user and the service provider.

A score of 5 points is given if the acquirer does not provide a complete list of service models of the platform with the definition of functions. Not all differences are given, the answer contains some errors in defining the differences between services of different levels. There are inaccuracies in the formulation of the division of functions between the user and the service provider.

A score of 4 points is given if the acquirer does not provide a complete list of service models of the platform with errors in defining their functions. Not all differences are given, the answer contains certain errors in defining the differences between services of different levels. There are errors in the formulation of the division of functions between the user and the service provider.

A score of 3 points is given if the applicant incorrectly defines the composition of service models of the platform with errors in defining their functions, the answer contains significant errors in defining the differences between services of different levels. There are significant errors in the formulation of the distribution of functions between the user and the service provider in the SaaS model.

A score of 2 points is given if the acquirer has incorrectly defined the composition of the service models of the platform, there are significant errors in defining their functions for different levels of the model stack. There are significant errors in the formulation of the division of functions between the user and the service provider. There are a significant number of errors when describing the functions of the SaaS model.

A score of 1 point is given if the acquirer has incorrectly defined the composition of the service models of the platform, there are significant errors in defining their functions for different levels of the model stack. There are significant errors in the formulation of the division of functions between the user and the service provider. The composition of the functions of the SaaS model is incorrectly specified.

A score of 0 points is given for failure to complete the task in general.

Task 2.

This task is evaluated on a 10-point scale.

A score of 10 points is given if the applicant fully provides the principles and a detailed scheme of organizing the use of Microsoft Azure cloud services. The composition of the roles used on the platform is given in full, their purpose and functions are explained in detail and reasonably.

A score of 9 points is given if the applicant fully provides the principles and scheme of organizing the use of Microsoft Azure cloud services. The composition of the roles used on the platform is given in sufficient volume, their purpose and functions are explained in detail.

An assessment of 8 points is given if the applicant does not provide the principles and scheme of organization of the use of Microsoft Azure cloud services in full. The list of roles used on the platform is sufficiently detailed, but their purpose and functions are not fully explained.

A score of 7 points is given if the applicant has inaccurately given the principles and scheme of organizing the use of Microsoft Azure cloud services. There are inaccuracies regarding the composition of the roles used on the platform, their purpose and functions are not explained.

A score of 6 points is given if the applicant has given the principles and scheme of organizing the use of Microsoft Azure cloud services with some errors. There are inaccuracies regarding the

composition of the roles used on the platform, there are no explanations regarding their purpose and function.

A score of 5 points is given if the applicant has given the principles and scheme of organizing the use of Microsoft Azure cloud services with errors. There are significant inaccuracies regarding the composition of the roles used on the platform, some explanations regarding their purpose and function are missing.

An assessment of 4 points is given if the applicant provided the principles and scheme of organizing the use of Microsoft Azure cloud services with significant errors. There are errors regarding the composition of the roles used on the platform, certain explanations regarding their purpose and function are missing.

A score of 3 points is given if the applicant presented the principles and scheme of organizing the use of Microsoft Azure cloud services with significant errors. There are certain errors regarding the composition of the roles used on the platform, there are no explanations regarding their purpose and function.

An assessment of 2 points is given if the applicant incorrectly presented the principles and scheme of organization of the use of Microsoft Azure cloud services. The composition of the roles used on the platform is incorrectly given, there is no explanation about their purpose, the functions do not correspond to the content of their use.

An assessment of 1 point is given if the applicant incorrectly presented the principles and scheme of organization of the use of Microsoft Azure cloud services. The composition of the roles used on the platform is incorrectly given, there are generally no explanations about their purpose, and the functions do not correspond to the content of their use.

A score of 0 points is given for failure to complete the task in general.

Task 3.

This task is evaluated on a 10-point scale.

A score of 10 points is given if the acquirer provides a complete and explained composition of the components of the AWS cloud platform. A comprehensive description and main functions of the "Calculation" component, its content and areas of practical application are given.

A score of 9 points is given if the acquirer provides a complete and explained composition of the components of the AWS cloud platform. An exhaustive description and main functions of the "Calculation" component, spheres and areas of practical application are provided.

A score of 8 points is given if the acquirer does not provide a complete and explained composition of the components of the AWS cloud platform. A complete description and main functions of the "Calculation" component, areas and areas of practical application are given.

A score of 7 points is given if the acquirer does not fully and with justified explanations provide the composition of the components of the AWS cloud platform. The complete characteristics and functions of the "Calculation" component are given, and the possible areas of practical application are formulated in a sufficient volume.

A score of 6 points is given if the acquirer does not fully and with some explanation provide the composition of the components of the AWS cloud platform. An incomplete description and some functions of the "Calculation" component are presented, possible areas of practical application are not formulated.

A score of 5 points is given if the acquirer does not provide a complete and unexplained composition of the components of the AWS cloud platform. An incomplete description and some functions of the "Calculation" component are presented, directions for practical application are formulated.

A score of 4 points is given if the acquirer does not provide the composition of the components of the AWS cloud platform in full and without explanation. An incomplete description and not all

functions of the "Calculation" component are presented, directions of practical application are not precisely formulated.

A score of 3 points is given if the acquirer provides an incomplete list of components of the AWS cloud platform without justification. An incomplete description and not all functions of the "Calculation" component are provided, directions for practical application are not formulated.

A score of 2 points is given if the acquirer provided an incorrect composition of the components of the AWS cloud platform. An incorrect description is presented, the functions of the "Calculation" component are not accurately formulated, there are no directions for practical application.

A score of 1 point is assigned if the acquirer provides an incorrect composition of the components of the AWS cloud platform. Incorrect characteristics are presented, the functions of the "Calculation" component are incorrectly formulated, there are no directions for practical application.

A score of 0 points is given for failure to complete the task in general.

Task 4.

This task is evaluated on a 10-point scale.

An assessment of 10 points is given if the applicant has given in full and with justified explanations composition of IBM service solutions for the cloud platform. The composition of the main components of the platform is substantiated with the definition of their functions.

An assessment of 9 points is given if the applicant mainly and with justified explanations is given composition of IBM service solutions for the cloud platform. The composition of the main components of the platform is substantiated and given, including mainly their functionality.

An assessment of 8 points is given if the acquirer mainly and with certain explanations is given composition of IBM service solutions for the cloud platform. The composition of the main components of the platform is substantiated, with a description and features of functionality.

A score of 7 points is given if the applicant provides inaccuracies and explanations composition of IBM service solutions for the cloud platform. The composition of the main components of the platform is presented, with a detailed description of their functionality.

An assessment of 6 points is given if the applicant with certain inaccuracies and some explanations gives composition of IBM cloud platform service solutions. The composition of the main components of the platform is given, but without a description of their functionality.

A score of 5 points is given if the applicant gives some errors and without explanations composition of IBM service solutions for the cloud platform. The composition of the main components of the platform is described, but without a description of their functionality.

A score of 4 points is given if the applicant gives incorrect and unexplained information composition of IBM service solutions for the cloud platform. An incomplete composition of the platform components is given, without a description of their functionality.

A score of 3 points is given if the applicant gives incorrect and unexplained information composition of IBM service solutions for the cloud platform. The inaccurate composition of the platform components is given, without a description of their functionality.

An assessment of 2 points is given if the applicant with errors and without explanations is given incomplete composition of IBM service solutions for the cloud platform. The composition of the platform components and their functionality is presented with errors.

A score of 1 point is given if the applicant gives an incorrect answer with significant errors and without explanation composition of IBM service solutions for the cloud platform. The composition of the platform components and their functionality is presented with significant errors.

A score of 0 points is given for failure to complete the task in general.

RECOMMENDED LITERATURE

Main

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