

Sample Entrance Test – Informatics

Instrukce k testu:

You have 50 minutes for the test. There are 25 questions. Only one answer is correct. Do not close or minimise the window of your browser. Do not forget to submit the test in time. The time is measured from the opening of your test in your browser. If you do not submit the test properly it will not be assessed.

Způsob vyhodnocení: Only correct answers are counted.

1. What multiplicity of relationship represents this situation between student and course? Each student can attend any number of different courses. Each course can be attended by up to 30 students. 4

Select one from the following options.

- a) The multiplicity is 1:N.
- b) The multiplicity is M:N.
- c) The multiplicity is M:1.
- d) The multiplicity is 1:1.

2. The algorithm for sorting values can achieve the best time complexity belonging to a class 4

Select one from the following options.

- a) linear
- b) logarithmic
- c) log-linear
- d) quadratic

3. What is the purpose of dynamic routing protocols (e.g. RIP, OSPF, EIGRP)? 4

Select one from the following options.

- a) for dynamic selection of outgoing interface on the switch (L2 network device) for IP packet
- b) to add information about remote networks into the routing table on the router
- c) to modify the IP packet header – add the next-hop IP address (next router)
- d) to detect congested transmission lines and inform the admin about problems with routing IP packets

4. The most important technological component in terms of business support is 4

Select one from the following options.

- a) application software
- b) a CASE system
- c) a database system
- d) an operating system

5. Which languages would you use to implement the frontend of this entrance test? 4

Select one from the following options.

- a) PHP
- b) HTML
- c) Java
- d) HTML, Javascript

6. In the following query, fill in the correct keyword. 4

SELECT employees.lastname, departments.name FROM employees JOIN departments _ _ _ _ _ (departments_id)

Select one from the following options.

- a) ON
- b) LEFT
- c) BY
- d) USING

7. What is a collection? 4

Select one from the following options.

- a) Situation where a set of objects point to one given object.
- b) A set of values given by the parametric constructor.
- c) A set of related values unified into a class or structure that are public (e.g., x, y, z coordinates).
- d) A set of values of the same type, for example, an array of pointers to objects of a particular class.

8. The set of connections between the elements of a system is called: 4

Select one from the following options.

- a) structure
- b) universum
- c) state
- d) environment

9. For a matrix 4

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 1 \\ 2 & 3 & -1 \end{bmatrix}$$

find the inverse matrix $B = A^{-1}$.

Select one from the following options.

- a) $b_{11} = 5/3, b_{23} = 0, b_{31} = 1/3$
- b) $b_{11} = 5/3, b_{23} = 1/3, b_{31} = -1/3$
- c) $b_{11} = 1/3, b_{23} = 0, b_{31} = -1/3$
- d) $b_{11} = -5/3, b_{23} = 1/3, b_{31} = -1/3$

10. Which of the following propositions is a negation of the proposition „No student in the class wears glasses“? 4

Select one from the following options.

- a) At least one student in the class does not wear glasses.
- b) Not every student in the class wears glasses.
- c) At least one student in the class wears glasses.
- d) Every student in the class wears glasses.

11. Determine which of the operations (projection and restriction) are performed in the following query. 4

SELECT * FROM employees WHERE lastname LIKE 'No%';

Select one from the following options.

- a) projection and restriction

- b) only restriction
- c) neither projection nor restriction
- d) only projection

12. In the abstract data type "priority queue", which of the operations is different compared to the abstract type "queue": 4

Select one from the following options.

- a) printing all values
- b) removing a value
- c) inserting a new value
- d) emptiness test

13. Assume that an algorithm stores a result to a file after performing the necessary calculations. The location and name of the file is derived from the digits obtained from the system time. Which of the following properties the algorithm does not have? 4

Select one from the following options.

- a) repeatable
- b) deterministic
- c) finite
- d) universal

14. Find the limit $\lim_{x \rightarrow \infty} \frac{x^2 - 1}{3x^2 - 2x}$. 4

Select one from the following options.

- a) 0
- b) ∞
- c) $\frac{1}{3}$
- d) $\frac{1}{9}$

15. On what business activities is the global architecture block called OIS (Office Information System) not focused? 4

Select one from the following options.

- a) support for teamwork
- b) support for office activities
- c) increasing the productivity of administrative staff
- d) measuring employee efficiency

16. Which property must apply to the equivalence relation? 4

Select one from the following options.

- a) reflexive
- b) antisymmetric
- c) universal
- d) connex

17. There is a table of employees with columns id_emp, firstname, lastname, salary, department. The first three columns are mandatory, the remaining optional. Choose the command that is syntactically wrong. 4

Select one from the following options.

- a) DELETE salary FROM employees WHERE id_emp = 15;
- b) INSERT INTO employees (firstname, lastname, id_emp, salary) VALUES ('Newton', 'Phil', 142, 25000);

- c) INSERT INTO employees VALUES (10, 'X', 'Y', NULL, 10);
- d) UPDATE employees SET department = NULL WHERE id _ emp IN (SELECT id _ emp FROM employees WHERE firstname LIKE 'X%');

18. The IS architecture is not: 4

Select one from the following options.

- a) a graphic and textual description of the overall concept of IS in the company
- b) the arrangement of computers and printers in the company's network
- c) a way to ensure the stability of IS development in the time of rapid technological development and constant changes in the environment
- d) significant means of communication between IS creators and company management

19. Your task is to create a simple static website where information is not going to change. Which tools would you use? 4

Select one from the following options.

- a) HTML, CSS
- b) Node.js, Express
- c) Nette, PHP
- d) CSS, Javascript

20. It is necessary to process a sequence of data containing at least one element, where the total number of values is not known. Optimal for this processing will be a conditional loop: 4

Select one from the following options.

- a) with conditions both at the beginning and at the end
- b) with a condition at the end
- c) with a condition inside the loop
- d) with a condition at the beginning

21. Which of the following applies to metallic UTP (Unshielded Twisted Pair) cabling often used in Ethernet networks: 4

Select one from the following options.

- a) the maximum possible transmission speed is 100 Mbit/s
- b) the maximum usable length of one cable is 100 meters
- c) an RJ11 type connector is usually used at both ends
- d) it is resistant to electromagnetic interference

22. A random variable X has a probability density function 4

$$f(x) = \begin{cases} 2x & \text{for } x \in (0; 1) \\ 0 & \text{otherwise.} \end{cases}$$

What is the probability that the variable takes on values in the interval $(\frac{1}{2}; 1)$?

Select one from the following options.

- a) $\frac{1}{2}$
- b) $\frac{2}{3}$
- c) $\frac{1}{4}$
- d) $\frac{3}{4}$

23. Polymorphism in object-oriented programming means: 4

Select one from the following options.

- a) Class constructors are not inherited.
- b) There can be multiple methods in the class with the same name but different parameters.
- c) Attributes of different classes can have the same name.
- d) A method inherited into successors of a particular class can have different implementations in them.

24. A backend written in Node.js runs on a single thread - all user requests are handled in one thread. However, it is possible to deploy several backend instances. For which application is it the least suitable? 4

Select one from the following options.

- a) A backend collecting data from one machine in a manufacturing company where 1GB of data is generated each hour, it is necessary to ensure the sequential access to the data.
- b) An application for a national news portal with expected millions of users daily
- c) A web site of a primary school
- d) A backend for processing videos on a portal like Youtube

25. What is a regular expression? 4

Select one from the following options.

- a) An expression that describes the structure of a text string.
- b) An abstract notation of an algorithm independent of a specific programming language.
- c) An expression defining conditions for correct input values of a method or function.
- d) An expression that must be valid in the code under all conditions (e.g., the sine of an angle must be defined on the interval $\langle -1; 1 \rangle$).

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