

## **Educational course "Information technologies" (main thematic issues)**

### **For students of the Bachelor program of physical medicine and rehabilitation**

1. The concept of information. Its properties . Efficiency indicators.
2. Volume of information.
3. Signal. Information transmission channels.
4. Types of medical information: General systemic; Sanitary; clinical; Engineering- technical; Medical technological.
5. Set. Concepts of set the Basic operations on the sets.
6. Elements of mathematical logic. The logic of expressions.
7. Operations on expressions: negation, negation of negation, conjunction, disjunction, implication, equivalence.
8. Basic concepts of cybernetics. Medical cybernetics. Its constituent parts: computational diagnostics of the disease, cybernetic approach to the management of the healing process, automated management systems and their application in the health care organization. Cybernetic functions of the organism.
9. Automated management systems and their health care organization.
10. Modeling in Biology and Medicine. Classification of models
11. Types of medical data: quantitative data, qualitative data, static data, dynamic images Dynamic data.
12. Evaluation of medical data: marking, parameter, scale of measurement. Interval scale, relativity scale.
13. Operations to be performed on medical data:
  - Data collection and primary processing,
    - Evaluate data effectiveness,
    - Data storage,
    - Data formalization and standardization,
    - Data filtering and cleaning,
    - Data encoding,
    - Data sorting,
    - Data conversion,
    - Data compression and archiving,
    - Data protection,
    - Data transportation.
14. Preparing text document in MS Word.
15. Data processing and work in MS Excel.
16. General Composition and sample. Methods of obtaining a sample. Nominal, numerical and ordinal values. Schedules.
17. Elements of Probability Theory. The event and its types .

18. Basic statistical characteristics. Mean Arithmetic, Weighted Mean, Mode, Median, Characteristics of scattering, instability of observation results. Mean square deviation, dispersion, coefficient of variation.
19. Random variable and its distributions.
20. Statistical hypothesis. Statistical hypothesis testing.
21. Correlation. Parametric method of determining the correlation coefficient. Pearson's correlation coefficient.
22. Nonparametric methods for determining the correlation coefficient. Spearman's rank correlation.
23. Statistical programs, their purpose and use in medicine.

### Typical examination tests in the educational course "Information Technologies"

1. What does medical informatics study?
  - a) medical technological processes,
  - b) programming languages,
  - c) information processes of the healthcare system,**
  - d) forms of diagnostic measures.
2. Coding of information means:
  - a) writing information in letters,
  - b) transforming information into an adequate signal,**
  - c) presentation of information in the form of a combination of numbers,
  - d) transferring information to paper.
3. What is Bodi?
  - a) unit of information transfer rate,**
  - b) voltage measurement unit,
  - c) unit of measurement of information,
  - d) Current measuring unit.
4. What does the term "message information volume" mean?
  - a) the number of letters in this message,
  - b) the number of characters in this message,
  - c) the number of words in this message,
  - d) the number of bits in this message.**
5. The main purpose of the management system is:
  - a) transfer of cybernetic system from one state to another,
  - b) processing of information received through feedback channels and generation of managerial influence,**
  - c) transformation of the biological system,
  - d) use of results obtained by cybernetic methods.
6. Convert the number 77 from decimal to binary

a) **1001101** b) 111011, c) 10101011, d) 1110111.

7. Convert the number 111011 from binary to decimal

a) 89 b) **59** c) 45, d) 98.

8. Determine the given  $(\neg p) \vee (\neg q \wedge p)$  logical representation is true or false, if the proposition, the q-false:

a) true b) **false**

9. What criteria are used to evaluate the effectiveness of measurement methods?

a) accuracy, completeness, repeatability and consistency of measurements,

b) completeness, accuracy and consistency of measurements,

c) accuracy, efficiency and cost of measurements,

**d) accuracy, correctness, consistency and repeatability of measurements.**

10. What is an ordinal scale?

a) a scale on which the zero point is strictly defined during measurement,

**b) a sequence of natural numbers arranged in ascending or descending order,**

c) a scale on which the numbers are arranged only according to ranks,

d) grouping of the object in rows of mutually intersecting classes.

11. The data obtained as a result of the experiment are 10, 13, 6, 7, 3, 12, 7, 4. Calculate:

11.1. Average

a) 6; b) 5.5 b) **6.5** d) 4.5

11.2. Median

a) 4.5; b) 5.5; c) **d) 6.5**

11.3. Mode

a) 3; b) **c) 3.7** d) 6, 5

11.4. Range

**a) 9** b) 3; c) 4; d) 6

11.5. Standard deviation

a) 3 b) **3.25** c) 4; d) 4.25

11.6. Coefficient of variation

a) 55; b) **c) 50** d) 58

12. Below are the ages (X) and systolic blood pressure (Y) of 12 individuals:

X : 27, 29, 45, 60, 50, 65, 70, 62, 75, 38, 40, 48

Y : 110, 120, 130, 170, 180, 160, 160, 130, 180, 140, 120, 160.

Please choose the correct answer for each question below to determine the relationship between these two quantities:

12.1. Mean for X

**a) 50.75** b) 42.65; c) 52.5; d) 49.25

12.2. Mean for Y

a) 120.5; b) 140; **c) 146.67** d) 150.6

12.3.  $(\bar{X} \text{ avg.}) \times (\bar{Y} \text{ avg.})$

a) 3001.5; b) 3100.4; c) ~~3039.98~~ **3039.98**

12.4. ( $\bar{X}$  avg.)

a) ~~2730.20~~ **2730.20**; b) 2630.5; c) 2765.6; d) 2700.8;

12.5. ( $\bar{Y}$  avg.)<sup>2</sup>

a) 6400.2; b) 6528.4; c) ~~6428.45~~ **6428.45**

12.6.  $r_{xy}$

a) 0.7 **b) 0.75**; c) 0.8; d) 0.85

12.7.  $r'_{xy}$

a) **0.77**; b) 0.85; c) 0.52; d) 0.65

12.8.  $t =$

a) 3.25; b) ~~2.68~~ **3.67**; c) 2.89

12.9. The connection is reliable

a) **Yes** b) no