*Załącznik nr 7 do OPINII Rady Dziekańskiej Wydziału Matematyki i Informatyki Uniwersytetu Warmińsko-Mazurskiego w Olsztynie z 23 lutego 2021 r. w sprawie: zaopiniowania pytań na egzamin dyplomowy obowiązujących od 1 czerwca 2021*

**EXAM QUESTIONS FOR THE GRADUATION CERTIFICATE**

**SECOND DEGREE MASTER STUDIES**

**FIELDS OF STUDY: INFORMARCTION SCIENCE**

**SPECIALITY DATA SCIENCE IN PRACTICE**

**(applicable from 1st June 2021)**

1. Generations of operating systems and computer architectures.
2. The beginnings of computer networks.
3. The first programmable computers.
4. The first Polish computers.
5. Clock synchronisation.
6. Consistency and multiplication.
7. Exclusion versus concurrency-driven.
8. Process migration versus agent technology.
9. Modelling as a way of reality description.
10. Cellular automata.
11. Stochastic simulations and Monte Carlo method.
12. Pseudorandom number generation.
13. The ways to calculate similarity between objects (samples).
14. Optimal discretization algorithm for decision systems with attributes with continuous values.
15. The idea of Boolean reasoning on the example of finding decision reducts in decision systems.
16. The idea of back propagation as a method for neural network learning.
17. Fuzzy concept.
18. Operations on fuzzy sets.
19. The idea of a fuzzy controller.
20. Elementary data structures in the python language
21. Code organisation in modules and packages.
22. Applications of visualization in data mining. Value comparisons, proportions, relationships visualization.
23. Visualization, explainability of classification models using Kernel SHAP.
24. Generators and iterators.
25. Decorators.
26. Object-oriented programming in python.
27. Errors, exceptions handling issues.
28. The statistical tests used to compare data mining models.
29. Algebraic operations used in data preprocessing.
30. The calculation of data correlations.
31. Domain-specific repositories of open research data.
32. Characteristics of procedures and functions in PL/SQL.
33. Triggers.
34. Error handling in PL/SQL.
35. Data analysis steps according to CRISP-DM standard.
36. Data preprocessing techniques.
37. Specify the three classification methods you are familiar with..
38. Regression methods.
39. Reinforcement learning concept.
40. Data clustering.
41. Convolutional neural networks - LeNET as an example.
42. Association rules.
43. Data mining model evaluation methods.

1. Big data analysis methods.
2. GPU versus CPU efficiency in massive data analysis calculations.
3. Which elements should a good IT security policy contain?
4. Security audit.
5. Symmetric versus asymmetric encryption.
6. Digital signature
7. Cryptographic hash functions.

**Topics of questions:** 1 – 4 history of computer science; 5 – 8 distributed systems; 9 – 12 computer simulation; 13 – 19 systems of artificial intelligence; 20 – 21 introduction to python; 22 – 23 data visualization and exploration; 24 – 27 advanced python; 28 – 30 basics of statistics and algebra; 31 – 34 databases and data sources; 35 – 43 machine learning; 44 big data analysis; 45 Introduction to GPU programming; 46 – 50 data security