

QUESTIONS FOR DIPLOMA EXAMINATION
IN EFFECT SINCE THE ACADEMIC YEAR 2021/2022

Field of study: Electronics and Telecommunications

Specialty: Electronics, Photonics, Microsystems (EPM)

Form and level of studies: full-time studies, second-level studies

Questions in the field of studies:

1. Describe correlation and regression methods
2. Fundamental methods of descriptive statistics and their role in engineering
3. Describe a concept of a number from a mathematical and computer engineering point of view
4. Discuss the problem and methods used in a single- and multicriteria optimization
5. List possible applications of numerical differentiation methods in engineering
6. Describe the difference between such terms as: modeling, simulation and optimization
7. Simplex algorithm in solving linear optimization problems
8. Iterative methods of searching for the minimum of function
9. Graphic method in solving linear optimization problems
10. Analytical methods of searching for the minimum of function with and without constraints
11. Analyze Bose-Einstein distribution and characterize Bose-Einstein condensate
12. Types of conventional superconductors and their short description
13. Enumerate properties of conventional superconductors and analyse the phase diagram
14. Analyze Fermi-Dirac distribution and define Fermi's energy
15. Molecular electronic devices – list elements and present short description of their operation, advantages and limitations of electronic systems with such elements
16. What is NANOTECHNOLOGY? Impact of this field on the development of optoelectronic devices
17. Methods of detection and actuation in a microscale - discuss the basic types and their properties.
18. Methods of detection in microscale - principles of operation and examples
19. Principle of operation, technology and parameters of selected MEMS type sensor (pressure sensor or accelerometer)
20. Please discuss the bathtub curve and present the physical characteristics of the adaptation period, random failure period and wear-out period
21. Please list the criteria important for building reliability models and characterize the most frequently used models (Arrhenius, Eyring, power, Coffin-Manson)

Questions in the filed of studies and specialty:

1. Name the advantages of optical fibers. Supply the quantitative data or examples supporting the claims.
2. Name and characterize the methods of connecting optical fibers.
3. Draw a diagram showing the dependence of attenuation of the silica-glass optical fiber on wavelength. Provide values and units for attenuation and wavelengths.
4. Name categories of dispersion of optical fibers. Provide appropriate units and values for each category."
5. Snell's law, critical angle, and total internal reflection. Please provide the relevant drawings and equations.
6. Please list, classify and characterize parameters of optical fibers
7. Energy harvesting with microsystems - classification of harvesting methods and examples of applications
8. Optical atomic microclock CPT – principle of operation, components, fabrication of optical cell, application
9. Optical microcomponents made with microsystem technology
10. The classification of vacuum gauges
11. Give classifications of vacuum pumps and present one representative example
12. Define the basic parameters of vacuum pumps and describe the disadvantages of selected pumps in this context
13. Compare the file systems used in operating systems
14. Compare Windows and Linux operating systems
15. List, discuss and describe the method of determining the basic parameters of PV cells
16. Explain the construction, principle of operation of conventional photovoltaic cells
17. Discuss the advantages of photovoltaics as an alternative source of green energy
18. Defects in PV cells, modules and photovoltaic systems – potential causes and their effects
19. Applications of photovoltaics
20. Discuss the basic mechanisms and mathematical description of thermal energy transport
21. Compare mathematical methods used in engineering to describe continuous phenomena
22. Discuss the basic phenomena / coupled fields concerning thermoelectric effects
23. Compare mathematical methods used in engineering to describe continuous phenomena
24. List and characterize numerical methods used in computer programs for modeling and simulation
25. Discuss the basic mechanisms and mathematical description of thermal energy transport
26. Lab-on-chips – systematic, construction, functions, applications
27. Microfluidic flows –basic phenomena and its applications
28. Discuss the method of bonding LTCC with other materials
29. Passive components made with LTCC technique - construction and properties
30. Fabrication of microchannels in LTCC substrates
31. Discuss the deposition methods of thick-films on ceramic substrates
32. Methods and systems for semiconductor lasers and LEDs power supply and control
33. Methods and systems for displaying alphanumeric and graphical information
34. Please list and classify fabrication methods of planar waveguides. Shortly characterize each method
35. What features / properties of semiconductor heterostructures can be analyzed based on the results of photoluminescence (PL) spectra, including PL measurements in temperature or excitation power domain?
36. Explain the difference between the radiation flux and the luminous flux, between the photometric curve and the photometric solid, and describe methods for measuring the total radiation flux.
37. One of the main parameters of LED is External quantum efficiency dependent on the extraction coefficient. List and describe the LED construction solutions which provide the improvement of external quantum efficiency.