

## **PROBLEMS FOR DIPLOMA EXAMINATION OF 2ND CYCLE STUDIES**

### **TOPICS RELATED TO STRUCTURAL DESIGN**

#### **TOB PROFILE**

1. Formulations of the boundary value problems (local and global) and conceptions of their approximate solutions.
2. Selected numerical methods (approximation of functions, solution of: linear and nonlinear algebraic equations as well as systems of such equations, algebraic eigen problems, differential equations) that are used in computational mechanics.
3. Idea of FEM discretization for 1D and 2D problems.
4. The basic similarities and differences between FEM and FDM concepts
5. Classification of error sources in computational methods.
6. Behaviour of rod systems subjected to geometric and thermal loads.
7. Natural and forced vibrations, resonance and damping
8. Types, properties and application of advanced building materials and products.
9. Basic issues of structures protection against corrosion.
10. Structural systems in buildings, spatial rigidity.
11. High-rise RC monolithic and prefabricated frame buildings.
12. Masonry buildings: types, construction rules and calculation methods.
13. Timber structures: timber as a structural material - characteristics, advantages and disadvantages, residential timber buildings, types of roof rafters and their elements, glued-laminated timber, laminated veneer lumber (LVL), laminated strand lumber (LSL) and their use in constructions, designing of timber structures, connectors in timber structures. Wood protection.
14. Energy-efficient building systems, thermal and moisture aspects of materials and building partitions (walls, floors, roofs, flat roofs, woodwork), methods of reducing heat losses through infiltration and ventilation, renewable energy. Energy assessment of buildings
15. Construction and calculation problems of steel basic structures: cross-section, bar member, frame.
16. Influence of local buckling on carrying capacity of steel girders
17. Construction and calculation problems of steel hall/skeleton buildings

18. Construction and calculation problems of certain metal sheets structures (e.g. tanks, silos, pipelines).
19. Basis of prefabrication and typification of concrete elements and structures (types of connections, support conditions of precast elements); the issues of structural design and detailing of precast structures, including liquid storage tanks.
20. Design, dimensioning and detailing of advanced RC structural systems (frames, slab – column systems, deep walls).
21. General method of design of concrete pre-stressed structures - analysis of magnitude of pre-stressing force, design rules for elements subjected to bending and shear forces.
22. Rules of designing of pre-stressed and post-tensioned concrete floors.
23. Rules of designing and detailing reinforcement in monolithic storage tanks for liquids and bulk materials.
24. Design rules for machine foundation.