



**NEMZETI
KÖZSZOLGÁLATI
EGYETEM**
LUDOVIKA

VÍZTUDOMÁNYI KAR

FINAL EXAM TOPICS

CIVIL ENGINEER (BSC)



2024, BAJA

CIVIL ENGINEER (BSC)

HYDRAULIC STRUCTURES

1. Characteristics of concrete components used in concrete and reinforced concrete structures of hydraulic engineering structures, their investigation; preparation, transport and laying of concrete

- quality requirements for national cement varieties
- additives and their main characteristics, their examination
- water
- transportation and storage of cement
- making of concrete
- transportation, outwork, aftercare of concrete
- concrete with resistance to aggressive effects
- making of underwater concrete by standing funnel, moving funnel and water displacement method

2. Insulation of buildings against rain and groundwater; insulation methods, rules of construction

- the appearance of groundwater
- requirements for insulation
- black insulation
- sheet metal insulation
- plastic insulation
- passing through special details, dilatations, fittings

3. Design of load bearing structures of a Simpler civil engineering facility (with masonry load bearing structure and prefabricated slabs of prefabricated elements) and construction of the structure

- description of plane foundation methods
- inspection of the load-bearing capacity of brick and concrete masonry, rules of construction
- structure design of slabs made of prefabricated reinforced concrete elements, rules of construction

4. Design and construction of opened, regular rectangular shaped concrete basins

- the considered load cases
- determination of standard stresses for the sidewall and the bottom plate
- design of reinforcing steel (crack limitation)
- testing the stability of the object (floating)
- solutions for external and internal insulation
- concrete technology (work direction, work gaps)

5. Design and construction of reinforced concrete base walls (angular retaining walls)

- testing the stability of the object
- determination of the load on the retaining wall
- design of reinforcing steel
- construction technology (earthworks, concrete technology)

6. Design and construction of rectangular culverts

- definition of transverse and longitudinal stresses
- design and construction of reinforcing steel
- making dilations
- construction technology

7. Watercourse locking devices with movable end-caps; design and construction of insert beams, one-piece planks

- structural design and dimensioning of insertion beams
- construction of one-piece planks
- dimensioning of multiple primary beam planes
- solving the slide bearing guided sides of the boards
- security of waterproofing in the side wall and bottom groove
- actuators, determination of lifting force

8. Stability of earthworks

- soil description and classification
- lateral earth pressures
- slope stability analysis
- types of slip surface
- effects of water on slope stability
- stability of embankments
- general configuration of embankments and cuttings

9. Construction of earthworks; construction of embankments and channels using construction machinery

- setting out of earthworks
- foundation of embankments
- excavation technologies

10. General structure, design and construction of pavements for earthworks

- layers and materials of pavements
- base of pavements
- general configuration of stone and precast concrete pavements
- construction process of pavements

11. Strutting system of excavations; design of strutting systems for trenches; trench shoring with panels

- materials of struts
- general configuration of struts
- design of strutting systems for trenches
- construction technology of trench shoring with panels

12. ULS design of foundation systems

- design of shallow foundations
- sliding resistance
- factors influencing the depth of foundation level

13. SLS design of foundation systems

- settlement calculation
- verification for uplift (UPL)
- verification of equilibrium limit state (EQU)

14. Materials, types and construction technology of sheet pile walls; bracing methods of sheet pile walls; prestressed grouted anchoring

- shapes and joints of steel sheet pile walls
- driving and removing of sheet pile walls
- design of anchored sheet pile walls
- construction technology and general configuration of prestressed grouted anchoring

15. Dewatering excavations with open sump pumping method, application and construction technology of groundwater lowering systems

- range of application for dewatering methods
- construction technology and configuration of open sump pumping systems
- well point systems, discharge estimation
- operation of groundwater lowering
- construction guidelines

16. Dewatering excavations using vacuum wells, technology, range of application

- comparison of hydraulics of well points and vacuum wells
- construction technology of vacuum wells
- operation of dewatering using vacuum wells
- discharge estimation

17. Prefabricated reinforced concrete piles (driven piles), field of application, their manufacturing and beating technologies

- classification of piles by load transfer, material and technology
- Prefabricated reinforced concrete driven piles: application areas, construction, production, beating technology, beating rules
- Test load on piles

18. In situ made piles, Fields of application, technology of production

- classification of piles by load transfer, material and technology
- CFA, SOIL, MEC: application areas of piles, their structural design
- structural design and technology of micro piles
- test load on piles

19. Areas of application of well and box foundations, their structural design

- areas of application
- structural design
- sinking technologies
- sinking schedule

20. Areas of application of slurry wall foundations, their structural design

- areas of application
- Gap side wall stability
- characteristics, preparation and purification of the support fluid
- Slurry wall technology, slit types

21. Organization of construction work

- information needed to organize
- components of the construction process
- Workflow resource requirements, material, working time, machine work requirements
- organization in building site, contents of the organization plan
- Organizing in time, depicting the time course of work processes

22. Preparation of itemized budgets for construction work on the basis of construction plans

- parts of the construction plan, generally and occasionally
- the purpose and application of the EMIR
- the order of items structure
- the item as a design guide
- the possibilities of using the itemized budget

23. Public procurement of investments

- the concept and subjects of public procurement
- Preparation of the procedure by the customer
- drawing up and submitting tenders
- conduct of the procedure (evaluation, publication)

24. Road transport networks

- Classifying roads by positioning, terrain and traffic, characterizing urban and rural roads,
- Line of elements of road transport networks, the rules of their connection,
- Design rule for horizontal, vertical and spatial lines,
- Calculation of the parameters of a pure circular arc alignment (main and detailed points),
- The concept of vision (stopping and overtaking), its interpretation and its relation to the development of line of elements of road transport networks.

25. Traffic engineering knowledge

- Traffic counting goals, methods, data,
- Time horizons, forecasting of expected traffic,
- The concept and definition of average daily traffic (ADT) and standard hourly traffic (SHT),
- Determining the design speed, choosing the parameters of the road according to the design traffic,
- Traffic lanes and typical dimensions of the road section.

26. Road junctions

- Classification of nodes,
- Target traffic matrix and Traffic flow diagram,
- Principles of designing level nodes, application possibilities, layout examples,
- Elements, design rules, layout examples of different level nodes.

27. Road structures

- Construction of earthworks, soil types to be built, load bearing requirements of earthworks
- Types of road structures and pavements, characteristics of flexible and rigid pavements, layering of pavements and their materials
- Steps for designing flexible roadway structures, defining traffic load classes, choosing track structure
- Defining of concrete road structure and construction technology, gap formations
- Drainage of surface and groundwater, characterization of melting and frost damage, protection against them, elements of drainage solutions and its structures
- Principles and possibilities of reinforcing asphalt road structure

REGIONAL WATER MANAGEMENT

1. The theoretical background of lowland drainage and methodology of design

- lowland water concentration characteristics, hydrological, soil, agriculture, environmental, basic concepts
- surface drainage design tasks, plan types, their content and preparation tasks
- channel and road network location design, longitudinal - and cross section design principles, channel network hydrology, scaling methods, the specific flow definition, the water concentration theory, and empirical data on the basis
- the elements of the drainage network, channels, structures, pumping stations and their hydraulic design methods

2. The practice of lowland drainage

- drainage network construction, maintenance and operation, responsibilities, procedures and tools
- preparation tasks of the inland flooding defence, organisation structure and readiness stages and protection methods, interventions

3. The regulation procedure of soil moisture and groundwater table.

- the drainage concept, goals, characteristic procedures, soil, and soil mechanical foundations of it.
- drainage methods and additional procedures
- drainage design, drainage construction work

4. Urban rainwater management

- the characterization of the urban water concentration process, situation analysis of water management state and principles
- international and domestic development of procedures of Urban water management
- urban drainage design, hydrological and hydraulic procedures, methods

5. Erosion

- Erosion phenomenon and forms
- generating and influencing factors of erosion and damages
- soil resistance, erosion-free slope length, slope categories, coverage, exposure
- hillside catchment management, agricultural and technical methods (Ramparts, terraces, contour ditches, etc.)

6. Ravine stabilization

- Ravine genesis, damage
- Ravine survey
- Ravine stabilization methods and structures

7. Stream regulation

- Cause of Stream regulation
- Stream survey, regulation principles, hydrological and hydraulic design
- standard cross-section design, locational and vertical design
- structure and paving design
- nature harmonic water management principles and structure design

8. Urban Local flood control on Hillside

- Cause of urban local flood control on hillside
- Methods of urban local flood control
- site maintenance of rainwater and its structures
- rainwater reservoirs
- retarding reservoir application options

9. Purpose and mode of irrigation

- irrigation water demand, and irrigation water-quota calculation
- agricultural needs of the designing and operating of irrigation sites
- description and evaluation of irrigation methods with regard to the purpose of irrigation
- irrigation water intake structures
- irrigation channels plant control, water level control, water distribution
- structures of irrigation channels

10. Surface irrigation farms

- main elements and design methods of the surface irrigation farms, advantages, disadvantages
- location plan
- groov and trickling irrigation technical design
- flood irrigation facility design, and structures
- landscaping for irrigation

11. Sprinkler and drip irrigation

- structure of the nozzles, their characteristics, selection of the nozzle to be used
- wing wire types, operating properties
- hydraulic dimensioning of the irrigation facility, the pipeline optimization
- the pumps selection, optimal pump lifting height determined
- the drip irrigation principles, water norm, the advantage and disadvantages of application,
- the water dispenser item classification, technical solutions, and their characteristic curve
- the drip irrigation facility general design
- the pipe network hydraulic sizing
- the irrigation water quality needs, water purification procedures

12. Fish ponds

- fish farming technical conditions
- fishponds operation, the applied lake types, main dimensions
- lowland fishpond systems design, earth works, structures
- hillside fishpond systems design, earth works, structures

13. Water storage

- The purpose of storage, reservoir types
- basic elements of storage
- morphologic characteristic curve of reservoirs
- water cycle of reservoirs, water losses and their calculation
- silting of reservoirs, the dead space sizing

14. Conservation- and water damage prevent reservoirs

- conservation reservoir sizing
- determination of the performance curve
- flood peak mitigation reservoirs characteristics
- managed and unmanaged sluice flood peak mitigation reservoir systems operation, sizing

15. Earth works of reservoirs

- geometric and structural design of earthworks,
- earth works stability control
- protection of earth works against rainwater and waves beating
- monitoring system of reservoirs and operation tasks

16. Structures of reservoirs

- tasks of the structures
- selecting the location of structures, key structural elements
- hydrological and hydraulic dimensioning of the sluiceway
- operational intake structures and river sluice design
- complex structures of reservoirs

17. Objectives, planning the preparation, and methods of river management

- natural river formation and morphological characterization of these.
- sediment transport of rivers
- the ice formation process, the ice regime characteristics, the protection against adverse ice phenomena
- regulation principles in high- mean- and low water regime
- the calculation of the significant flood level, the bed form discharge, and the low water level of navigation
- landscape and sample cross sectional design
- design of the flood riverbed

18. Structures of river management

- regulation structures classification according to their structural design and material
- longitudinal and cross structures
- structures building technologies
- environmentally friendly materials and technologies

19. River use

- waterway definition, characteristics, developing and maintaining
- port design
- the river channeling principles and basic elements
- the main parts of barrages, type of shut-off devices
- ship locks task, operation, main structural elements, filling and emptying systems
- basic definitions of hydropower use, turbines basic types and characteristics

20.Lake management

- water cycle of lakes
- methods and structures of water level control
- bankline regulation, bank structures
- lake port design
- water quality questions of lake regulation

21.Flood protection's goals and methods

- flood prevention methods (flood management, mitigation of flood damage sensitivity)
- methods of flood damage mitigation (flood protection, victims support)
- flood management with embankments, flood plain formation
- design aspects, construction of flood protection dikes
- The system of the embankments on Hungary
- directions and tasks of hungarian flood protection development

22.Flood protection (1)

- the earth dam at onset of flood protection phenomenon grouping
- flood protection methods of higher water level then the dam
- defense methods against waves beating
- emergency flood retention storage
- localization

23.Flood protection (2)

- defense methods against seepage, soaking, dam slideing, dam streaming, sand boil
- discrimination of streaming and sand boil
- flood protection tasks related to structures
- review, maintain of flood protection dams

24.Institutional framework of flood protection

- law basics and background of flood protection and flood defence
- national governance organization and decision-making levels of flood protection
- territorial governance organization of the flood protection
- tasks assigned to the various grade of flood protection

25.And the most important peculiarities of the water management, the Hungarian water management legal framework

- the most important factors what determin the Hungarian water management development
- Institutional framework of water management
- the international relations of water management
- Law about the water management (1995. LVII.)
- the water management authority for its content and organisational framework of the the authority functions
- water rights licensing

26. Water resources management

- the task of water resources management
- meaning of water resource, its types, exploration, evaluation
- available supplies
- the water demand and water use group, the water resources and water demand compare: water balance (area and time units, representation)
- water storage and water transfer rules in water resources management

27. Water Framework Directive (WFD)

- major tasks for the implementation of the WFD, deadlines assigned to the tasks
- criteria of the selection of water bodies
- types of water bodies
- parts of River Basin Management Plan (RBMP)
- Institutional framework of WFD
- the society's involvement in wfd implementation
- what are the significant water management issues river basin management plan when preparing?
- what is the aim of the action programs of basic and supplementary measures? how to plan those?
- economic aspects of making RBMP

28. Tasks and type of WFD monitoring system

- surveillance monitoring, operational monitoring, investigative monitoring, surface water and groundwater monitoring
- aspects of monitoring networks: surface water bodies, groundwater bodies, local networks, regional networks, international networks

29. Ecological-based status assessment of water bodies

- quality characteristics of the ecological status to determine
- test groups of organisms, habitat characterization
- water-polluting substances and their effects

30. Cost-effectiveness studies aims, elements (the domestic and international practice)

- cost-effectiveness studies take into account indirect effects
- determination of disproportionate costs
- action programmes design, main phases of design and related items
- action elements and action packages design
- action programmes composition and the society's consultation role