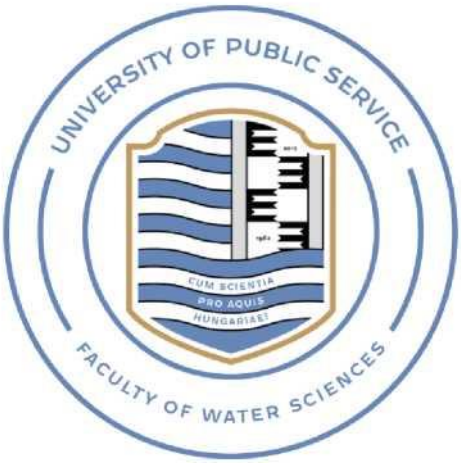
FINAL EXAM TOPICS

CIVIL ENGINEER (BSC)



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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
   - strength design and construction rules of the RC beams working together with the monolithic RC plates
   - 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 angle retaining walls and weight retaining walls**
   - boundary states to be examined, testing the stability of the object
   - determination of the load on the retaining wall
   - design of reinforcing steel
   - dewatering of retaining walls
   - construction and operation requirements

- 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 using construction machinery**
   - setting out of earthworks
   - foundation of embankments
   - soil improvement and stabilization methods
   - embankment body and F100 layer design
   - types of frost damage, frost protection planning
   - excavation technologies

10. **Design and implementation of the dewatering/drainage of earthworks**
    - draining surface waters
    - management of groundwaters
    - dewatering of earthworks during the building process
    - drainage of the base lazer of earthworks

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

- slip resistance of the pavement and its role in road design (longitudinal and lateral friction, factors influencing sliding friction, effect of the pavement surface on slip resistance),
- line of elements of road transport networks, the rules of their connection,
- design rule for horizontal, vertical and spatial lines,
- dynamic reasons for dimensioning different alignment elements (curves, transition curves, etc.),
- 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

- 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
- typical basic speed concepts

26. Rail transport facilities

- railway resistances (running resistances, auxiliary resistances)
- horizontal and vertical alignment of the railway track (cant, curve, transition curve, concept of neutral line, line development)
- structural elements of the railway track (rails, rail fastenings, rail joints, sleepers)
- basic concepts related to turnouts and crossings (main parts of turnouts, main types of turnouts, main types of crossings, structural design of turnouts)

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 of concrete road structure and construction technology, gap formations
- effect of heavy axle weights and their conversion to unit axle weight
- drainage of surface and groundwater, characterization of melting and frost damage, protection against them, elements of drainage solutions and its structures

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 resistence, erosion-free slope length, slope categories, coverage, exposure
   - hillside cathment management, agricultural and technical methods (Ramparts, terraces, conture ditches, etc.)

6. **Ravine stabilization**
   - ravine genesis, damage
   - ravine survey
   - ravine stabilization methods and structures

7. **Stream regulation**
   - couse 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

- couse of urban local flood control on hillside
- methods of urban local flood control
- site maintenance of rainwater and it's 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 woks, structures
- hillside fishpond systems design, earth woks, 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 sising
- 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 reservoire

- 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 riverbad

18. Structures of river management

- regulation structures classification according to their structural design and material
- longitudinal and cross structures
- structures building technologies
- environmentally friendly materialsand 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
- methodes and structures of water lever 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

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
- localization

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

- the most important factors what determine 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 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