
**CIVIL ENGINEERING EXAMINATIONS
SYLLABUS**

GROUP A

COMPULSORY EXAMINATIONS (6 REQUIRED)

98-Civ-A1 Elementary Structural Analysis

Computation of reactions, shearing forces, normal forces, bending moments, and deformations in determinate structures. Influence lines for moving loads. Moment distribution, slope deflection, and energy methods for indeterminate structures without sidesway.

98-Civ-A2 Elementary Structural Design

Limit states design concepts. Loading due to use and occupancy, snow, wind, and earthquake. Design of tension members, beams, and columns in timber and steel. Design of timber connections and simple welded and bolted connections in steel. Design of determinate reinforced concrete beams and columns.

98-Civ-A3 Environmental Engineering

Population, economic growth, industrialization, urbanization and energy-use, as causes of environmental pollution.

The characteristics of particles, chemistry of solutions and gases, material balances, reaction kinetics, microbiology and ecology, as related to the environment.

The application of environmental principles (technical and non-technical) to: water resource management, water and wastewater treatment, air pollution control, solid waste management, environmental impact assessment, sustainable development and environmental ethics.

98-Civ-A4 Geotechnical Materials and Analysis

Materials: Origin of soils, soil identification and classification. Compaction. Permeability, pore water pressure and effective stress. Compressibility and consolidation. Shear strength, stress paths, and critical states. Frost action. Associated laboratory tests.

Analysis: Elastic stress distribution, settlements, times of settlements. Introductory analysis of lateral earth pressures, bearing capacity, and slopes. Seepage; well flow and confined 2-D flow problems.

98-Civ-A5 Hydraulic Engineering

Dimensional analysis and hydraulic models. Application of continuity, momentum and energy principles. Steady, closed conduit flow in single pipes and pipe networks. Steady, open-channel flow under uniform and gradually varied conditions, control sections, hydraulic jumps, and energy dissipaters. Hydraulic transients; surges and water hammer in closed conduits, surface waves in open channels. Concepts and principles of turbo machinery, especially centrifugal pumps; similarity relations and cavitation; operation of pump-and-pipe systems.

Introductory concepts of hydraulic structures, including environmental aspects of hydraulic works and water quality management.

98-Civ-A6 Transportation Planning and Engineering

Socio-economic impacts on transportation, demand modelling. Characteristics of transportation systems; rail, road, air, water, and pipelines. Transportation systems in Canada. Characteristics of traffic flow, queuing theory, capacity analysis, space-time diagrams. Urban traffic management, traffic signals, pedestrians, accidents. Intelligent transportation systems.

Note: No available text, including the one recommended, adequately covers all topics in the Syllabus. Candidates will have to seek more depth on: ADeterministic≅ queuing theory; rail, air, water, and pipeline systems; accidents.

GROUP B

ELECTIVE EXAMINATIONS (3 REQUIRED)

98-Civ-B1 Advanced Structural Analysis

Analysis of statically indeterminate structures, including trusses, beams, frames, and arches. Formulation of flexibility (force) and stiffness (displacement) methods of analysis.

98-Civ-B2 Advanced Structural Design

Limit states design of steel members and connections in continuous framing; of slabs and footings in reinforced concrete, of pre-stressed concrete members and assemblies; and of composite steel-concrete construction. Influence of creep and shrinkage in concrete construction.

98-Civ-B3 Geotechnical Design

Characterization of natural deposits, subsurface investigation, and field measurements. Design procedures for settlement and stability of shallow and deep foundation systems in soil and rock. Design of excavations and retaining structures; slopes and embankments. Geoenvironmental design topics covering seepage through dams and landfills and the control of seepage through the use of filters and low permeability layers including the use of geosynthetic liners and filters.

98-Civ-B4 Engineering Hydrology

Hydrologic processes: precipitation and snow melt, infiltration, evaporation and evapotranspiration, ground-water flow, runoff. Point and area estimates of precipitation. Stream flow measurement. Runoff hydrographs, unit hydrographs, conceptual models of runoff, and basics of hydrologic modeling. Channel system: reservoir and lake routing, channel routing and flood wave behavior. Statistical methods: frequency and probability with application to precipitation, floods, and droughts.

Urban and highway drainage structure design.

98-Civ-B5 Water Supply and Wastewater Treatment

Physical, chemical, and microbiological characteristics of water and wastewater. Regulation of water quality for supply and discharge, elements of receiving water characterization and specification of effluent limits. Elements of water and wastewater treatment including, coagulation, flocculation, filtration, settling, softening, disinfection, fluoridation, taste and odour control and biological processes. Sludge disposal.

Quantity and quality estimation of water and wastewater. Water storage and distribution systems. Wastewater

collection systems.

98-Civ-B6 Urban and Regional Planning

The context of urban planning; basic planning studies, including population, economic, and land-use studies. The strategy, development, and engineering associated with comprehensive plans and full infrastructure development including housing, industry, transportation, recreation, water and sewerage, social service components. The use of analytical procedures and data systems. Plan implementation measures and controls, including zoning, land subdivision, and urban renewal. The role of the planner in directing and monitoring urban and regional development.

98-Civ-B7 Highway Design, Construction, and Maintenance

Route surveying. Geometric design, including horizontal and vertical alignment and intersections. Properties of road-making materials. Asphalt mix design. Structural design for flexible and concrete pavements. Earthworks and drainage. Pavement management, including condition evaluation, maintenance, and rehabilitation.

98-Civ-B8 Management of Construction

Size and structure of Canadian design and construction sectors. Methods of project delivery, project management, and organizational form. Site investigation. Estimating and bidding, project planning, scheduling and control, activity planning. Safety practices and regulations, insurance, quality assurance and control. Labour relations. Contract administration. Litigation.

98-Civ-B9 Civil Engineering Analysis and the Finite Element Method

Introduction to discretization techniques for solving Civil Engineering problems. The finite element method including; derivation of element and global force-displacement equations employing both the variational and direct stiffness methods, criteria for selection of approximating functions, available finite elements, general constitutive relations, substructure analysis and constraint equations, numerical methods of solution. Finite element applications to structural, geotechnical, and hydraulic engineering analysis.

**The Association of
PROFESSIONAL ENGINEERS AND GEOSCIENTISTS
of British Columbia**

1998 CIVIL ENGINEERING SYLLABUS
Checklist for Self Evaluation
(Not required for candidates who are assigned
confirmatory exams)

Name: _____

Exam Number	Exam Name	Applicant=s Self-Evaluation - Course Equivalent	For Office Use Only
<i>Basic Studies (6 Required)</i>			
04-BS-1	Mathematics		
04-BS-2	Probability and Statistics		
04-BS-3	Statics and Dynamics		
04-BS-6	Mechanics of Materials		
04-BS-7	Mechanics of Fluids		
04-BS-14	Geology		
<i>Basic Studies (2 required)</i>			
04-BS-4	Electric Circuits and Power		
04-BS-5	Advanced Mathematics		
04-BS-10	Thermodynamics		
04-BS-11	Properties of Materials		
04-BS-12	Organic Chemistry		
04-BS-13	Biology		
<i>Group A (6 required)</i>			
98-Civ-A1	Elementary Structural Analysis		
98-Civ-A2	Elementary Structural Design		
98-Civ-A3	Environmental Engineering		

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98-Civ-A4	Geotechnical Materials and Analysis		
98-Civ-A5	Hydraulic Engineering		
98-Civ-A6	Transportation Planning and Engineering		
<i>Group B (3 Required)</i>			
98-Civ-B1	Advanced Structural Analysis		
98-Civ-B2	Advanced Structural Design		
98-Civ-B3	Geotechnical Design		
98-Civ-B4	Engineering Hydrology		
98-Civ-B5	Water Supply and Wastewater Treatment		
98-Civ-B6	Urban and Regional Planning		
98-Civ-B7	Highway Design, Construction, and Maintenance		
98-Civ-B8	Management of Construction		
98-Civ-B9	Civil Engineering Analysis and the Finite Element Method		
<i>Complementary Studies (All Required)</i>			
98-CS-1	Engineering Economics		
98-CS-2	Engineering in Society - Health, Safety, and the Environment		
98-CS-3	Management Concepts for Engineers		

**Suggested Text
1998 CCPE Civil Syllabus**

**** NOTE TO CANDIDATES, THE LISTED TEXTBOOKS BELOW ARE ONLY SUGGESTED. THE LIST DOES NOT DEFINE OR LIMIT THE SYLLABUS.**

98-Civ-A1, Elementary Structural Analysis

Aslam Kassimali, Structural Analysis PWS Publishers Latest Edition ISBN # 0534950469

98-Civ-A2, Elementary Structural Design

Handbook of Steel Construction, Current Edition, Canadian Institute of Steel Construction

Concrete Design Handbook, Current Edition, Canadian Portland Cement Association

Wood Design Manual, Current Edition, Canadian Wood Council, Ottawa Tel: 613-247-7077

98-Civ-A3, Environmental Engineering

Gilbert M. Masters, Introduction to Environmental Engineering and Science, Prentice-Hall Inc., 1991. ISBN #0-13-483066-0.

Walter E. Westman, Ecology, Impact Assessment and Environmental Planning, John Wiley & Sons Inc., 1985. ISBN #0-471-89621-7 or 0-471-80895-4 (pbk).

J. Glynn Henry & Gary W. Heinke, Environmental Science and Engineering, Prentice-Hall Inc., 1989. ISBN #0-13-283177-5.

98-Civ-A4, Geotechnical Materials and Analysis

R.F. Craig, Soil Mechanics, 5th Edition, Chapman Hall

B.J. Das, Principles of Geotechnical Engineering, 4th Edition, PWS-Kent

98-Civ-A5, Hydraulic Engineering

R.L. Daugherty, J.B. Franzini and E.J. Finnermore, Fluid Mechanics with Engineering Applications, 8th Edition, McGraw-Hill, 1985 (omit chapters 5, 9, 16, and 17)

A suitable alternate text is:

V.L. Streeter, E.B. Wylie, Fluid Mechanics, SI Edition, McGraw-Hill, 1981 (omit chapter 6 on compressible flow) Note there may be a more recent version of this text if there is please use the latest edition.

98-Civ-A6, Transportation Planning and Engineering

C.S. Papcostas & P.D. Prevedouros, Transportation Engineering and Planning, Prentice-Hall, 2nd Edition

Note: No available text, including the one recommended, adequately covers all topics in the Syllabus. Candidates will have to seek more depth on: "Deterministic" queuing theory; rail, air, water, and pipeline systems; accidents.

98-Civ-B1, Advanced Structural Analysis

Ghali & A.M. Neville, Structural Analysis, Chapman & Hall, 4th Edition, John Wiley & Sons, New York, 1998 (edited by Garas & Virdi).

98-Civ-B2, Advanced Structural Design

Michel Bruneau, Chia-Ming Uang, Andrew Stuart Whittaker, Ductile Design of Steel Structures – McGraw Hill Co. 1998

Edward G. Nawy, Prestressed Concrete: A Fundamental Approach, 5th edition, Prentice Hall, 2005

98-Civ-B3, Geotechnical Design

B.M. Das, Principles of Geotechnical Engineering 4th edition ITP Nelson 1998 ISBN # 0-534-95179-1 (1-800-268-2222)

B.M. Das, Principles of Foundation Engineering 3rd Edition ITP Nelson 1995 ISBN # 0-534-20646-8 (1-800-268-2222)

R.F. Craig, Soil Mechanics, 5th or 6th Edition, Van Nostrand Reinhold (U.K.) Co. Ltd. Nelson Canada - ISBN # 0-412-39590-8 note both out of print

E.A. McBean, F.A. Rovers, G.J. Farquhar, Solid Waste Landfill Engineering and Design Prentice Hall PTR, 1995, ISBN 0-13-079187-3, Chapter 9, Chapter 10

R.M. Koemer, Designing with Geosynthetics, 3rd edition, Prentice Hall, 1994, ISBN 0-13-847823-6, Section 2.8 and chapters 5 and 6.

98-Civ-B4, Engineering Hydrology

Viessman, Knapp, Lewis & Harbaugh, Introduction to Hydrology, 2nd Edition, Harper Row (ISBN # 0-7002-24971)

Ven Te Chow, David R. Maidment & Larry W. Mays, Applied Hydrology, McGraw-Hill, 1988, ISBN # 0-07-010810-2

Ray K. Linsley & Joseph B. Franzini, Water Resources Engineering, 3rd Edition, McGraw-Hill, 1979, ISBN # 0-07-037965-3

98-Civ-B5, Water Supply and Wastewater Treatment

Viessman and Hammar, Water Supply and Pollution Control, 6th Edition, Harper Collins College Publishers ISBN # 0-321-01460-X, 1988

R.L. Droste, Theory and Practice of Water and Wastewater Treatment, J. Wiley and Sons Inc. New York, N.Y., 1997

98-Civ-B6, Urban and Regional Planning

Gerald Hodge, Planning Canadian Communities: An Introduction to the Principle, Practice and Participants, 3rd Edition, Nelson Canada, Toronto, 1998.

John Sewell, The Shape of the City – Toronto Struggles with Modern Planning, University of Toronto, Toronto, 1993.

Frank S. So and Judith Getzels (eds.) The Practice of Local Government Planning, 2nd Edition, International City Management Association, Washington D.C., 1988 (available at reference libraries) Consider supplemental to the two primary texts above.

Note: It is recommended that candidates contact the local Municipal Planning Office in their area and review material similar to the Citizen's Guide to the Land Use Planning System in Ontario (see www.mah.gov.on.ca/business/guides/index-e.htm).

98-Civ-B7, Highway Engineering

Huang, Yang H. Pavement Analysis and Design, 1993, Prentice Hall, Englewood Cliffs, New Jersey

American Association of State Highway and Transportation Officials (AASHTO), 1993. AASHTO guide for design of pavement structures. Washington, D.C.

Asphalt Institute (1989). The Asphalt Handbook. Manual Series # 4 (MS-4), Lexington, Kentucky

Roads and Transportation Association of Canada, 1986, Manual of geometric design standards for Canadian roads. Roads and Transportation Association of Canada, Ottawa.

Haas, R, Hudson, W.R., and Zaniewski, J., 1994. Modern Pavement Management, Krieger Publishing Company, Malabar, Florida

Or

Shahin, M.Y., 1994, Pavement Management for Airports, Roads and Parking Lots, Chapman & Hall, New York

Note to candidates, the above listed textbooks are only suggested text. The list does not define or limit the syllabus.

98-Civ-B8, Management of Construction

Donald S. Barrie and Boyd C. Paulson Jr., Professional Construction Management, McGraw-Hill, 1991, ISBN # 0070038899

Ontario Health and Safety Act, Ontario Regulation 213/91 (Construction Projects), Queen's Printing of Ontario, May 10, 1991. The provincial legislation is quite similar in all provinces. The candidate should obtain the Health and Safety Act of their province for study.

98-Civ-B9, Applications of the Finite Element Method

R.D. Cook, D.S. Malkus, & M.E. Plasha, Concepts and Applications of Element Analysis, 3rd Ed., John Wiley & Sons, ISBN # 0-471-84788-7

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