
**STRUCTURAL ENGINEERING EXAMINATIONS
SYLLABUS**

GROUP A

COMPULSORY EXAMINATIONS (6 REQUIRED)

07-Str-A1 (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.

07-Str-A2 (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.

07-Str-A3 (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.

07-Str-A4 Advanced Structural Analysis

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

07-Str-A5 (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.

****Select ONE from: 07-Str-A6-1, 07-Str-A6-2 or 07-Str-A6-3**

07-Str-A6-1 = (07-Str-B3) Applications of Finite Elements

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.

07-Str-A6-2 = (07-Str-B9) Advanced Structural Mechanics

Stress and equilibrium conditions, strain and compatibility conditions, stress-strain relations and yield/failure criteria are considered in the context of civil engineering materials. Two-and three-dimensional elasticity theory is developed, with an introduction to the use of tensor notation. Advanced topics in bending, shear and torsion of beams are also covered, as is elementary plate bending theory. Energy methods including virtual work, potential energy, strain energy, and related approaches. Importance of dynamic loads in the design of structures.

07-Str-A6-3 = (07-Str-B10) Earthquake Engineering

Structural dynamics related to practical analysis of earthquake-resisting structures. Analysis of single-degree systems include: free vibration, response to time-dependent forces, response to earthquake support motions, response spectra, hysteresis models, and computation of inelastic response. Concepts of energy dissipation, ductility, and inelastic displacement demands. Multi-degree building systems. Earthquake design provisions in national codes including: design loads, and special provisions for earthquake-resisting reinforced concrete and structural steel systems and members.

GROUP B

ELECTIVE EXAMINATIONS (3 REQUIRED)

07-Str-B1 (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.

07-Str-B2 (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.

07-Str-B3 Applications of Finite Elements

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.

07-Str-B4 Structural Materials

Linear and nonlinear material behavior, time-dependent behavior; structural and engineering properties of structural metals; behavior of wood; production and properties of concrete; bituminous materials, ceramics, plastics; advanced composite materials; cements and aggregates: types, chemistry, microstructure.

07-Str-B5 Foundation Engineering

Design of spread footings, rafts and pile foundations according to modern professional practice. Procedures for estimation of bearing capacity and settlements, both immediate and long term, design of structures associated with foundation excavations, drainage and site developments such as braced cuts, retaining walls and anchored sheet pile bulkheads. The role of geological history, penetration testing and simple index properties in prediction of foundation performance.

07-Str-B6 Building Engineering and Services

Functioning of the building enclosure: demonstration of the behaviour of building elements and their sub-assemblies under differential temperature and pressure stresses; fundamentals of acoustics; nature and use of building materials; response of building materials to climatic cycles, radiation, precipitation, heating and cooling; principles of building service systems, including electrical, gas, communications, service-water supply and distribution; introduction to plans, codes, and standards for utility distribution systems.

07-Str-B7 Forensic Engineering and Rehabilitation

Mechanisms of degradation of structures and forensic assessment of deteriorated structures; structural health monitoring and non-destructive evaluation of structures; repair strategies for deteriorated structures; designing stabilizing and strengthening techniques for structural elements.

07-Str-B8 Architectural Design and Engineering

The range of requirements that drive a building's design including architecture, engineering, constructability, building codes, and budget. The influence of technology, energy conservation, and environmental constraints on built form. Integration of structural and mechanical systems into building types including residential, office, commercial, and retail.

07-Str-B9 Advanced Structural Mechanics

Stress and equilibrium conditions, strain and compatibility conditions, stress-strain relations and yield/failure criteria are considered in the context of civil engineering materials. Two- and three-dimensional elasticity theory is developed, with an introduction to the use of tensor notation. Advanced topics in bending, shear and torsion of beams are also covered, as is elementary plate bending theory. Energy methods including virtual work, potential energy, strain energy, and related approaches. Importance of dynamic loads in the design of structures.

07-Str-B10 Earthquake Engineering

Structural dynamics related to practical analysis of earthquake-resisting structures. Analysis of single-degree systems include: free vibration, response to time-dependent forces, response to earthquake support motions, response spectra, hysteresis models, and computation of inelastic response. Concepts of energy dissipation, ductility, and inelastic displacement demands. Multi-degree building systems. Earthquake design provisions in national codes including: design loads, and special provisions for earthquake-resisting reinforced concrete and structural steel systems and members.

07-Str-B11 (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.

*****FOR ALL CIVIL COMMON EXAMINATION, PLEASE REFER TO THE SUGGESTED CIVIL TEXTBOOKS LIST AT THE END OF THIS DOCUMENT.**

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

2007 STRUCTURAL 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 (7 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-11	Properties of Materials		
04-BS-14	Geology		
<i>Basic Studies (1 required)</i>			
04-BS-4	Electric Circuits and Power		
04-BS-5	Advanced Mathematics		
04-BS-10	Thermodynamics		
04-BS-12	Organic Chemistry		
04-BS-13	Biology		
<i>Group A (6 required)</i>			
07-Str-A1	Elementary Structural Analysis		
07-Str-A2	Elementary Structural Design		
07-Str-A3	Geotechnical Materials and Analysis		

07-Str-A4	Advanced Structural Analysis		
07-Str-A5	Advanced Structural Design		
Select <u>ONE</u> from the following:			
07-Str-A6-1 =(07-Str-B3)	Applications of Finite Elements		
07-Str-A6-2 =(07-Str-B9)	Advanced Structural Mechanics		
07-Str-A6-3 =(07-Str-B10)	Earthquake Engineering		
Group B (3 Required)			
07-Str-B1	Geotechnical Design		
07-Str-B2	Management of Construction		
07-Str-B3	Application of Finite Elements		
07-Str-B4	Structural Materials		
07-Str-B5	Foundation Engineering		
07-Str-B6	Building Engineering and Service		
07-Str-B7	Forensic Engineering and Rehabilitation		
07-Str-B8	Architectural Design and Engineering		
07-Str-B9	Advanced Structural Mechanics		
07-Str-B10	Earthquake Engineering		
07-Str-B11	Hydraulic Engineering		
Complementary Studies (All Required)			
11-CS-1	Engineering Economics		
11-CS-2	Engineering in Society – Health and Safety		
11-CS-3	Sustainability, Engineering and the Environment		
11-CS-4	Engineering Management		

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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