



Professional Engineers
Ontario

To: Candidates Writing November 30 – December 11, 2020 National Technical Exams
From: Exam Centre
Email Contacts: exams@peo.on.ca
Date: September 14, 2020
Subject: Information for the Guidance of Candidates

IMPORTANT: As a condition for writing the technical exams, candidates are required to follow all procedures and protocols in place regarding the novel coronavirus/COVID-19 pandemic. These include a requirement that each candidate complete a Waiver and Release, to acknowledge risks associated with the pandemic and to relieve both PEO and the exam venue of liability for any adverse health and safety consequences that may flow from these risks. Any candidate who has not completed the Waiver and Release will not be permitted to write the examination. In addition, PEO may impose other requirements to protect health and safety, including requiring candidates to confirm that they are not showing any symptoms of illness, such as fever or cough, and have not exposed themselves to any of the risks associated with disease transmission, including recent travel to a significantly affected area. In addition, to protect health and safety PEO will conduct the exams in accordance with the most up-to-date guidance from provincial and local health authorities, which is subject to change.

1. December 2020 Timetable of Exams - enclosed

Exams will be held simultaneously at all centres; the morning exams begin at 9:30 a.m. and the afternoon exams begin at 2:00 p.m. All exams are of three-hour duration except BS-2, Probability and Statistics, which is a two-hour exam. Candidates are expected to arrive at the assembly area outside the exam room fifteen minutes before the starting time, to consult seating lists, etc. **Candidates who arrive late for the exam will be admitted up to one-half hour after the start, but no time extension will be allowed. No candidate may leave the exam room within the first half-hour of the exam period. Candidates are responsible for finding the location centre and arriving on time to write the exams, including during bad weather. Please note: Candidates are allowed only one, 5-minute washroom/personal break during the exam. You must alert the proctor in charge that you require a break. Your break will be noted on the attendance sheet. No electronic devices (cell phones, pagers, personal organizers) are permitted for the duration of the exam**

Please note candidates must show one piece of recent picture identification at the examination centre. (i.e., driver's licence, current passport, health card with picture, etc.)

2. Examiners' Advice to Candidates

Applicants should write in ink (ballpoint) rather than pencil. A paper written in ink is much easier to read.

If a candidate believes that there is an error on the exam, typographical or otherwise, the candidate must state an assumption regarding the error and continue with the exam. **Put your comments directly to the attention of the examiner in your written answer book. Even if you believe the question(s) asked was outside the scope of the current syllabus not the suggested textbook(s) or past exam papers. You may also submit an email immediately after writing the exam explaining any comments or concerns you may have had about the exam paper and your comments will be given to the examiner to mark accordingly.**

All applicants who are writing a Basic Studies exam should be aware that these exams correspond to 2nd or 3rd year level engineering courses and should not infer that because they are termed "Basic" that they are simple.

Carefully complete the outside cover of your exam book. If more than one book is used, number each book by showing its number in the series; i.e., 1 of 3, 2 of 3, and so on. **Indicate the questions you want marked on the front-page cover. This will clearly display to the examiner the questions you want marked.**

Read the paper through, including its title page; make any notes that occur to you on the left-hand (rough work) page of the exam book. Identify your rough work by Question Number. Start with the question you can answer best, first reading it again with care to ensure that you understand it. Identify it by its number. The sequence in which you attempt questions is at your choice.

Budget your time. Answer, if possible, the total number of questions that are required to be attempted. Spare time should be devoted to a review.

3. **List of Aids Permitted – listed below this document**

Format 1 - No calculator permitted. The exam may be **Closed** or **Open Book**.

Format 2 - There are two calculator models permitted for this format: either a Casio or Sharp model. The exam may be **Closed** or **Open Book**. **Note, any alpha letters that immediately follows the calculator model number is fine except for the letter ‘s’ which means the calculator is programmable. If the letter ‘s’ is in combination with other alpha letters, then the calculator is acceptable i.e. ‘ms’.** (Please note that “none” in the list of aids represents no further instructions for this exam.)

Format 3 - Any non-communicating calculator will be permitted. The exam will be an **Open Book** exam. Candidates will identify the calculator used on the inside left-hand sheet of the exam workbook; i.e., name and model designation. (Please note that “none” under aids and instructions represents that you may bring as many textbook(s) or notes etc. into the exam there is no restrictions with this format 3 exam.) Please note space allocated to candidates writing open book exams will be the same as closed book exams. Therefore, you will need to limit the number of textbooks brought into the exam room.

Closed Book - Only pens, pencils, and drawing instruments may be brought into the room. "If format 2 is selected, candidates are permitted to bring any approved Casio or Sharp calculator into the exam room."

Open Book - Any notes, textbooks, materials, etc. may be brought into the exam centre. (Where the examiner has specified only certain material, this is noted.)

Closed Book with Specified Aids - For some exams, a single, precisely identified aid is allowed. This is noted on the list under aids and instructions.

4. **Location of Exam Centres and Rooms – will be posted on PEO’s website closer to the exam date**

5. **Results of Exams**

Exam results will be mailed 45 working days after the last exam has been written (February 19, 2021). No results will be communicated by telephone, email, or in person.

If a candidate disagrees with an exam mark, they may request a re-read. There is a non-refundable fee of \$330.00 for every exam written for this service. There is no guarantee that a re-read will result to the favour of the candidate. The re-read mark will then be the final mark and the original mark can go up or down. Note: Failed papers are re-read by the examiner. A re-read request must be submitted within 30 days after receipt of results (not when results are received). The re-read grading will take eight weeks or longer. If you do request a re-read and do not receive a confirmation by email from the Exam Centre within two weeks of submittal of payment you must contact the Exam Centre immediately to confirm receipt of re-read request.

Exam papers will not be returned to the candidate or seen by the candidate, nor are the answers available. The passing mark is 50.

6. **The Following Are Not Allowed**

Use of notes on exams where none are permitted
Communicating with another candidate
Employment of another person to write an exam

7. **Leaving an Exam Room without Writing**

A candidate who appears in the exam room and then decides not to write the exam, must place the signed exam book in the envelope provided, sign the outside of the envelope, and hand it to the invigilator/proctor. Any such candidate is given a mark of **Zero** for the exam and this will be considered a failure.

8. **No Show**

Candidates who apply to write technical exams and do not attend the sitting(s) will be marked “**No Show**.” They will forfeit the exam fee, i.e., **no refund, credit or transfer to the next sitting. A “No Show” is not considered a failure or an attempt.** Candidates that were issued a reminder letter to write at this sitting and selected not to write for whatever reason the file is closed for time expiration and you will need to **re-apply again with another license application form to pursue licensure.** Note: A “No Show” is better than writing an exam you do not feel prepared to write and might fail, even if it means having this current file closed. Candidates can re-apply again with another licence application form.

November 30, December 1, 2, 3, 4, 7, 8, 9, 10, 11, 2020

Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Basic Examinations

Dec 7 – pm - 04-BS-1, Mathematics

Dec 2 – pm - 04-BS-2, Probability and Statistics

Dec 3 – pm - 04-BS-3, Statics and Dynamics

Nov 30 – am - 04-BS-4, Electric Circuits and Power

Nov 30 – pm - 04-BS-5, Advanced Mathematics

Dec 1 – am - 04-BS-6, Mechanics of Materials

Dec 4 – am - 04-BS-7, Mechanics of Fluids

Dec 9 – pm - 04-BS-8, Digital Logic Circuits

Dec 8 – pm - 04-BS-9, Basic Electromagnetics

Dec 2 – pm - 04-BS-10, Thermodynamics

Dec 10 – am - 04-BS-11, Properties of Materials

Dec 8 – pm - 04-BS-12, Organic Chemistry

Dec 7 – pm - 04-BS-13, Biology

Dec 7 – am - 04-BS-14, Geology

Dec 11 – am - 04-BS-15, Engineering Graphics & Design Process

Dec 3 – pm - 04-BS-16, Discrete Mathematics

Complementary Examinations

Dec 1 – pm - 11-CS-1, Engineering Economics

Dec 2 – pm - 11-CS-2, Engineering in Society

Dec 3 – pm - 11-CS-3, Sustainability, Engineering and the Environment

Nov 30 – am - 11-CS-4, Engineering Management

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Agricultural Examinations

Dec 1 – am - 04-Agric-B7, Principles of Hydrology

Dec 2 – pm - 04-Agric-B11, Principles of Waste Management

Biomedical Examinations

Dec 7 - pm - 04-Bio-A2, Process Dynamics and Control

Dec 1 – am - 04-Bio-A6, Anatomy and Physiology

Dec 2 – am - 04-Bio-A7, Fluid Mechanics

Dec 10 – am - 04-Bio-B4, Digital Image Processing

Dec 7 – am - 04-Bio-B5, Cell and Tissue Engineering

Dec 4 – am - 04-Bio-B6, Bioinstrumentation

Building Examinations

Dec 11 – am - 07-Bld-A1, Elementary Structural Analysis

Dec 11 – am - 07-Bld-A2, Elementary Structural Design

Dec 7 – am - 07-Bld-A3, Construction Engineering

Dec 8 – pm - 07-Bld-A4, Building, Engineering Systems

Dec 8 – am - 07-Bld-A5, Building Science

Dec 10 – am - 07-Bld-A7, Building Envelope Design

Dec 3 – pm - 07-Bld-B6, Building Energy Conversion Technologies

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Chemical Examinations

Dec 4 – am - 16-Chem-A1, Process Balances and Chemical Thermodynamics

Dec 1 – pm - 16-Chem-A2, Unit Operations & Separation Processes

Dec 3 – pm - 16-Chem-A3, Heat and Mass Transfer

Nov 30 – pm - 16-Chem-A4, Chemical Reactor Engineering

Dec 9 – pm - 16-Chem-A5, Chemical Plant Design and Economics

Dec 8 – am - 16-Chem-A6, Process Dynamics and Control

Dec 3 – pm - 16-Chem-B2, Environmental Engineering

Dec 2 – am - 16-Chem-B4, Biochemical Engineering

Dec 3 – am - 16-Chem-B6, Petroleum Refining and Petrochemicals

Nov 30 – am - 16-Chem-B10, Life Cycle Assessment (LCA)

Civil Examinations

Nov 30 – pm - 16-Civ-A1, Elementary Structural Analysis

Dec 11 – am - 16-Civ-A2, Elementary Structural Design

Dec 10 – pm - 16-Civ-A3, Municipal and Environmental Engineering

Dec 3 – am - 16-Civ-A4, Geotechnical Materials and Analysis

Dec 2 – am - 16-Civ-A5, Hydraulic Engineering

Dec 8 – am - 16-Civ-A6, Highway Design, Construction, and Maintenance

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Civil Examinations

Dec 9 – pm - 16-Civ-B1, Advanced Structural Analysis

Dec 7 – pm - 16-Civ-B2, Advanced Structural Design

Dec 11 – am - 16-Civ-B3, Geotechnical Design

Dec 2 – am - 16-Civ-B4, Engineering Hydrology

Nov 30 – am - 16-Civ-B5, Water Supply and Wastewater Treatment

Dec 4 – am - 16-Civ-B7, Transportation Planning and Engineering

Dec 8 – pm - 16-Civ-B8, Management of Construction

Dec 8 – am - 16-Civ-B9, The Finite Element Method

Dec 9 – pm - 16-Civ-B10, Traffic Engineering

Dec 8 – am - 16-Civ-B11, Structural Materials

Dec 9 – am - 16-Civ-B19, Foundation Engineering

Computer Examinations

Dec 8 – pm - 17-Comp-A1, Electronics

Dec 3 – pm - 17-Comp-A2, Digital Systems Design

Dec 1 – pm - 17-Comp-A3, Computer Architecture

Dec 3 – am - 17-Comp-A4, Program Design and Data Structures

Dec 7 – am - 17-Comp-A6, Software Engineering

Dec 9 – pm - 17-Comp-B10, Distributed Systems

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Electrical Examinations

Dec 7 – pm - 16-Elec-A1, Circuits

Dec 8 – pm - 16-Elec-A2, Systems and Control

Dec 8 – am - 16-Elec-A3, Signals and Communications

Dec 10 – am - 16-Elec-A4, Digital Systems and Computers

Dec 11 – am - 16-Elec-A5, Electronics

Dec 3 – pm - 16-Elec-A6, Power Systems and Machines

Dec 11 – am - 16-Elec-A7, Electromagnetics

Dec 10 – am - 16-Elec-B1, Digital Signal Processing

Dec 9 – pm - 16-Elec-B2, Advance Control Systems

Dec 8 – am - 16-Elec-B3, Digital Communications systems

Dec 8 – am - 16-Elec-B4, Information Technology Networks

Dec 8 – pm - 16-Elec-B5, Advanced Electronics

Nov 30 – am - 16-Elec-B6, Integrated Circuit Engineering

Dec 9 – am - 16-Elec-B7, Power Systems Engineering

Dec 8 – pm - 16-Elec-B8, Power Electronics and Drives

Nov 30 – am - 16-Elec-B9, Electromagnetic Field, Transmission

Dec 10 – pm - 16-Elec-B10, Electro-Optical Engineering

Environmental Examinations

Dec 7 – am - 18-Env-A1, Principles of Environmental Engineering

Dec 4 – am - 18-Env-A2, Hydrology and Municipal Hydraulics Engineering

Dec 7 – pm - 18-Env-A3, Geotechnical & Hydrogeological Engineering

Dec 8 – pm - 18-Env-A4, Water and Wastewater Engineering

Dec 10 – am - 18-Env-A6, Solid Waste Engineering and Management

Dec 7 - pm - 18-Env-B2, Water Resources

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Geological Examinations

Dec 7 – pm - 18-Geol-A1, Mineralogy and Petrology

Dec 2 – pm - 18-Geol-A2, Hydrogeology

Dec 1 – am - 18-Geol-A3, Sedimentation & Stratigraphy

Dec 4 – am - 18-Geol-A4, Structural Geology

Nov 30 – am - 18-Geol-A6, Soil Mechanics

Dec 9 – am – 18-Geol-B4, Geomorphology and Pleistocene Geology

Industrial Examinations

Dec 1 – am - 17-Ind-A1, Operations Research

Dec 10 – pm - 17-Ind-A2, Analysis & Design of Work

Dec 7 – am - 17-Ind-A4, Production Management

Dec 10 – am - 17-Ind-A5, Quality Planning, Control, and Assurance

Dec 3 – am - 17-Ind-A6, System Simulation

Dec 1 – pm - 17-Ind-B1, Applied Probability and Statistics

Dec 9 – am - 17-Ind-B2, Manufacturing Processes

Dec 4 – am - 17-Ind-B7, Financial and Managerial Accounting

Dec 4 – am - 17-Ind-B10, Workplace Health and Safety

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Manufacturing Examinations

Dec 7 – am - 08-Mfg-A3, Production Management

Dec 10 – pm - 08-Mfg-A4, Analysis & Design of Work

Dec 9 – pm - 08-Mfg-A5, Facilities Planning

Dec 10 – am - 08-Mfg-A6, Quality Planning, Control, and Assurance

Dec 3 – am - 08-Mfg-B3, System Simulation

Dec 9 – pm - 08-Mfg-B4, Product Design and Development

Dec 2 – pm - 08-Mfg-B6, Metrology

Dec 8 – pm - 08-Mfg-B8, Robot Mechanics

Dec 7 – pm - 08-Mfg-B10, Tooling, Jigs & Fixture Design

Dec 2 – am - 08-Mfg-B12, Ergonomics

Marine Examinations

Dec 7 – pm - 98-Mar-A2, Fundamentals of Naval Architecture

Dec 10 – pm - 98-Mar-A7, Marine Engineering

Mechanical Examinations

Dec 1 – am - 16-Mec-A1, Applied Thermodynamics and Heat Transfer

Dec 10 – am - 16-Mec-A2, Kinematics and Dynamics of Machines

Dec 7 – pm - 16-Mec-A3, System Analysis and Control

Dec 4 – am - 16-Mec-A4, Design and Manufacture of Machine Elements

Dec 2 – am - 16-Mec-A5, Electrical and Electronics Engineering

Dec 7 – am - 16-Mec-A6, Advanced Fluid Mechanics

Dec 10 – pm - 16-Mec-A7, Advanced Strength of Materials

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Nov 30 – am – 16-Mec-B1, Advanced Machine Design

Dec 2– am - 16-Mec-B2, Environmental Control in Buildings

Dec 10 – am - 16-Mec-B3, Energy Conversion and Power Generation

Dec 7 – am - 16-Mec-B4, Integrated Manufacturing Systems

Dec 9 – pm - 16-Mec-B5, Product Design and Development

Dec 4 – am - 16-Mec-B6, Fluid Machinery

Dec 3 – pm - 16-Mec-B7, Aero and Space Flight

Dec 9 – pm - 16-Mec-B8, Engineering Materials

Dec 2 – pm - 16-Mec-B9, Advanced Engineering Structures

Dec 4 – am - 16-Mec-B10, Finite Element Analysis

Dec 8 – pm - 16-Mec-B12, Robotics Mechanics

Mechatronics Examinations

Dec 7 – pm - 16-Mex-A1, System Analysis and Control

Dec 7 – pm - 16-Mex-A2, Circuits

Dec 9 – pm - 16-Mex-B8, Engineering Materials

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Metallurgical Examinations

Dec 1 – pm - 10-Met-A6, Phase Transformation and Thermal Treatment of Metals and Alloys

Dec 10 – pm - 10-Met-A7, Corrosion and Oxidation

Mineral Examinations

Dec 1 – am - 18, MMP-A1, General Geology and Exploration

Dec 2 – pm - 18-MMP-A2, Underground Mining Methods & Design

Dec 9 – am - 18-MMP-A3, Mineral Processing

Dec 10 – am - 18-MMP-A4, Mine Valuation and Mineral Resource Estimation

Nov 30 – am - 18-MMP-A6, Mining and the Environment

Material Examinations

Dec 1 – am - 12-Mtl-A1, Materials Thermodynamics

Naval Examinations

Dec 9 – am - 16-Nav-A2, Hydrodynamics of Ships(I): Resistance and Propulsion

Nuclear Examinations

Dec 10 – am - 08-Nuc-A1, Introduction to Nuclear Physics and Nuclear

Dec 10 – pm - 08-Nuc-A6, Nuclear Power Plant Systems & Operations

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Petroleum Examinations

Dec 7 – pm - 17-Pet-A2, Petroleum Reservoir Fluids

Dec 7 – pm - 17-Pet-A3, Fundamental Reservoir Engineering

Dec 10 – am - 17-Pet-A4, Oil and Gas Well Drilling and Completion

Dec 1 – pm - 17-Pet-A5, Petroleum Production Operations

Dec 9 – pm - 17-Pet-A6, Reservoir Mechanics

Dec 10 – pm - 17-Pet-A7, Secondary and Enhanced Recovery

Physical Examinations

Dec 9 – am - 17-Phys-A4, Quantum Mechanics

Dec 8 – pm - 17-Phys-A5-A, Electronic Materials and Devices

Nov 30 – am - 17-Phys-A5-B, Analog and Digital Electronic Circuits

Dec 7 – pm - 17-Phys-A6, Solid State Physics

Dec 10 – pm - 17-Phys-A7, Optics

Dec 8 – pm - 17-Phys-B5, Systems and Control

Dec 1 – am - 17-Phys-B6, Applied Thermodynamics and Heat Transfer

Software Examinations

Dec 8 – am - 19-Soft-A3, Software Design

Dec 10 – am - 19-Soft-A4, Real Time Systems

Dec 9 – am - 19-Soft-A5, Requirements and Specifications

Dec 11 – am - 19-Soft-A7, Software Development Process

Nov 30 – am - 19-Soft-B6, Software Project Management

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Morning exams 9:30 am – 12:30 pm – Afternoon Exams 2:00 pm – 5:00 pm

Structural Examinations

Nov 30 – pm - 07-Str-A1, Elementary Structural Analysis

Dec 11 – am - 07-Str-A2, Elementary Structural Design

Dec 3 – am - 07-Str-A3, Geotechnical Materials and Analysis

Dec 9 – pm - 07-Str-A4, Advanced Structural Analysis

Dec 8 – am - 07-Str-A6-1, The Finite Element Method

Dec 10 – pm - 07-Str-A6-3, Earthquake Engineering

Dec 11 – am - 07-Str-B1, Geotechnical Design

Dec 8 – pm - 07-Str-B2, Management of Construction

Dec 9 – pm - 07-Str-B5, Foundation Engineering

Dec 2 – am - 07-Str-B11, Hydraulic Engineering

Transportation Examinations

Dec 8 – am - 07-Tra-A2, Highway Design

Dec 3 – am - 07-Tra-A6/16-Civ-A4/07-Str-A3, Geotechnical Materials and Analysis

Water Resources Examinations

Dec 2 – am - 07-Wrse-A2, Engineering Hydrology

Dec 7 – pm - 07-Wrse-A3, Soil Mechanics & Groundwater (Env-A3 different name)

Nov 30 – am - 07-Wrse-B3, Water Supply & Wastewater Treatment

Format 1, No Calculators Permitted;

Format 2, One of two calculators is permitted - any Casio or Sharp approved model;

Format 3, Any non-communicating calculator is permitted.

Name of Subject Basic Studies	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
04-BS-1, Mathematics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae
04-BS-2, Probability and Statistics (2hrs)	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae. Note; statistical tables of the normal, t, chi-square and F distributions are provided
04-BS-3, Statics and Dynamics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae. The aid sheet must be submitted with the written exam paper.
04-BS-4, Electric Circuits and Power	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
04-BS-5, Advanced Mathematics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
04-BS-6, Mechanics of Materials	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae. Note, example problems and solutions to problems are NOT allowed. <u>THE AID SHEET MUST BE SUBMITTED WITH THE WRITTEN EXAM.</u>
04-BS-7, Mechanics of Fluids	2	CLOSED	NONE
04-BS-8, Digital Logic Circuits	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
04-BS-9, Basic Electromagnetics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
04-BS-10, Thermodynamics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
04-BS-11, Properties of Materials	2	CLOSED	NONE
04-BS-12, Organic Chemistry	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
04-BS-13, Biology	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
04-BS-14, Geology	2	CLOSED	NONE
04-BS-15, Engineering Graphics and Design Process	1	CLOSED	NONE
04-BS-16, Discrete Mathematics	2	CLOSED	NONE

Name of Subject Complementary Studies	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
11-CS-1, Engineering Economics	3	OPEN	Candidates should bring with them compound interest factors tables
11-CS-2, Engineering in Society- Health and Safety	1	CLOSED	NONE
11-CS-3, Sustainability, Engineering and the Environment	2	CLOSED	NONE
11-CS-4, Engineering Management	1	CLOSED	NONE

Name of Subject Agricultural	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
04-Agric-B7, Principles of Hydrology	3	OPEN	NONE
04-Agric-B11, Principles of Waste Management	3	OPEN	NONE

Name of Subject Biomedical/Biochemical	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
04-Bio-A2, Process Dynamics and Control	3	OPEN	NONE
04-Bio-A6, Anatomy and Physiology	2	CLOSED	NONE
04-Bio-A7, Fluid Mechanics	3	OPEN	NONE
04-Bio-B4, Digital Image Processing	1	CLOSED	NONE
04-Bio-B5, Cell and Tissue Engineering	3	OPEN	NONE
04-Bio-B6, Bioinstrumentation	2	CLOSED	NONE

Name of Subject Building	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
07-Bld-A1, Elementary Structural Analysis	2	CLOSED	NONE
07-Bld-A2, Elementary Structural Design	2	CLOSED	Handbooks and textbooks are permitted. <u>NO notes or loose sheets are allowed.</u>
07-Bld-A3, Construction Engineering	2	CLOSED	NONE
07-Bld-A4, Building Engineering Systems	2	CLOSED	NONE
07-Bld-A5, Building Science	3	OPEN	NONE
07-Bld-A7, Building Envelope Design	2	CLOSED	NONE
07-Bld-B6, Building Energy Conversion Technologies	2	CLOSED	NONE

Name of Subject Chemical	<i>Format</i> 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
16-Chem-A1, Process Balances and Chemical Thermodynamics	3	OPEN	NONE
16-Chem-A2, Unit Operations and Separation Processes	3	OPEN	Candidates can bring ONE textbook of their choice. The textbook can have notations listed on the margins but no loose notes are permitted.
16-Chem-A3, Heat and Mass Transfer	3	OPEN	One textbook of choice with notations listed on the margins but no loose notes are permitted.
16-Chem-A4, Chemical Reactor Engineering	3	OPEN	Candidates can bring ONE textbook of their choice. The textbook can have notations listed on the margins but no loose notes are permitted. Candidates should have unit conversion tables and/or mathematical tables such as a CRC handbook.
16-Chem-A5, Chemical Plant Design and Economics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
16-Chem-A6, Process Dynamics & Control	3	OPEN	NONE

16-Chem-B2, Environmental Engineering	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae. Candidates MUST write the name and model number of their calculator on the inside front cover of the exam book.
16-Chem-B4, Biochemical Engineering	2	CLOSED	NONE
16-Chem-B6, Petroleum Refining and Petrochemicals	3	OPEN	NONE
16-Chem-B10, Life Cycle Assessment (LCA)	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.

Name of Subject Civil	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
16-Civ-A1, Elementary Structural Analysis	2	CLOSED	NONE
16-Civ-A2, Elementary Structural Design	2	CLOSED	Handbooks and textbooks are permitted. <u>NO notes or loose sheets are allowed.</u> Candidates MUST write the name and model number of their calculator on the inside front cover of the exam book. Note: The solutions for Standards of Steel, Concrete & Timber must come from the latest manual editions.
16-Civ-A3, Municipal and Environmental Engineering	2	OPEN	NONE
16-Civ-A4, Geotechnical Materials and Analysis	2	CLOSED	NONE
16-Civ-A5, Hydraulic Engineering	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
16-Civ-A6, Highway Design, Construction and Maintenance	2	CLOSED	NONE
16-Civ-B1, Advanced Structural Analysis	2	CLOSED	NONE
16-Civ-B2, Advanced Structural Design	2	CLOSED	Design handbooks and textbooks are permitted. <u>NO notes or loose sheets are allowed.</u> Candidates MUST write the name and model number of their calculator on the inside front cover of the exam book.
16-Civ-B3, Geotechnical Design	3	OPEN	It is to the candidate's advantage to bring the Canadian Foundation Manual.
16-Civ-B4, Engineering Hydrology	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
16-Civ-B5, Water Supply & Wastewater Treatment	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.

16-Civ-B7, Transportation Planning and Engineering	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
16-Civ-B8, Management of Construction	2	CLOSED	NONE
16-Civ-B9, The Finite Element Method	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
16-Civ-B10, Traffic Engineering	3	OPEN	NONE
16-Civ-B11, Structural Materials	3	OPEN	Candidates can bring ONE textbook of their choice. The textbook can have notations listed on the margins but no loose notes are permitted.

Name of Subject Computer	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
17-Comp-A1, Electronics	3	OPEN	NONE
17-Comp-A2, Digital Systems Design	2	CLOSED	NONE
17-Comp-A3, Computer Architecture	3	OPEN	NONE
17-Comp-A4, Program Design and Data Structures	1	CLOSED	NONE
17-Comp-A6, Software Engineering	1	CLOSED	NONE
17-Comp-B10, Distributed Systems	2	CLOSED	NONE

Name of Subject Electrical	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
16-Elec-A1, Circuits	2	CLOSED	NONE
16-Elec-A2, Systems and Control	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae. <u>The aid sheet must be signed and submitted with the written exam paper.</u>
16-Elec-A3, Signals and Communications	2	CLOSED	NONE

16-Elec-A4, Digital Systems and Computers	2	CLOSED	NONE
16-Elec-A5, Electronics	2	CLOSED	NONE
16-Elec-A6, Power Systems and Machines	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae. <u>No worked out solutions are allowed on this sheet.</u>
16-Elec-A7, Electromagnetics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae. <u>No worked out solutions are allowed on this sheet.</u>
16-Elec-B1, Digital Signal Processing	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
16-Elec-B2, Advanced Control Systems	3	OPEN	NONE
16-Elec-B3, Digital Communications Systems	2	CLOSED	NONE
16-Elec-B4, Information Technology Networks	2	CLOSED	NONE
16-Elec-B5, Advanced Electronics	2	CLOSED	NONE
16-Elec-B6, Integrated Circuit Engineering	2	CLOSED	NONE
16-Elec-B7, Power Systems Engineering	3	OPEN	NONE
16-Elec-B8, Power Electronics and Drives	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae. <u>No worked out solutions are allowed on this sheet.</u>
16-Elec-B9, Electromagnetic Field, Transmission	2	CLOSED	NONE
16-Elec-B10, Electro-Optical Engineering	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.

Name of Subject Environmental	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
18-Env-A1, Principles of Environmental Engineering	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.

18-Env-A2, Hydrology and Municipal Hydraulics Engineering	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
18-Env-A3, Geotechnical and Hydrogeological Engineering	3	OPEN	NONE
18-Env-A4, Water and Wastewater Engineering	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
18-Env-A6, Solid Waste Engineering and Management	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
18-Env-B2, Water Resources	3	OPEN	NONE

Name of Subject Forest	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
04-For-A2, Wood Technology	2	CLOSED	NONE

Name of Subject Geological	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
18-Geol-A1, Mineralogy and Petrology	1	CLOSED	NONE
18-Geol-A2, Hydrogeology	3	OPEN	NONE
18-Geol-A3, Sedimentation & Stratigraphy	1	CLOSED	NONE
18-Geol-A4, Structural Geology	2	CLOSED	Protractor, drawing compass and ruler are permitted.
18-Geol-A6, Soil Mechanics	2	CLOSED	A compass and ruler are required
18-Geol-B4, Geomorphology and Pleistocene Geology	1	CLOSED	NONE

Name of Subject Industrial	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
17-Ind-A1, Operations Research	3	OPEN	NONE
17-Ind-A2, Analysis and Design of Work	2	CLOSED	NONE
17-Ind-A4, Production Management	2	CLOSED	NONE
17-Ind-A5, Quality Planning, Control, and Assurance	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
17-Ind-A6, Systems Simulation	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
17-Ind-B1, Applied Probability and Statistics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
17-Ind-B2, Manufacturing Processes	2	CLOSED	NONE
17-Ind-B7, Financial and Managerial Accounting	2	CLOSED	NONE
17-Ind-B10, Workplace Health and Safety	1	CLOSED	NONE

Name of Subject Marine	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
98-Mar-A2, Fundamentals of Naval Architecture	3	OPEN	NONE
98-Mar-A7, Marine Engineering	2	CLOSED	NONE

Name of Subject Mechanical	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
16-Mec-A1, Applied Thermodynamics and Heat Transfer	3	OPEN	Candidates are expected to have copies of both a thermodynamics text AND a heat transfer text in order to make use of the information presented in the tables and graphs. Candidates MUST write the name and model number of their calculator on the inside front cover of the exam book.

16-Mec-A2, Kinematics and Dynamics of Machines	3	OPEN	NONE
16-Mec-A3, System Analysis and Control	2	CLOSED	NONE
16-Mec-A4, Design and Manufacture of Machine Elements	3	OPEN	NONE
16-Mec-A5, Electrical and Electronics Engineering	2	CLOSED	NONE
16-Mec-A6, Advanced Fluid Mechanics	2	OPEN	NONE
16-Mec-A7, Advanced Strength of Materials	2	OPEN	NONE
16-Mec-B1, Advanced Machine Design	3	OPEN	NONE
16-Mec-B2, Environmental Control in Buildings	3	OPEN	Candidates are expected to have copies of both an environmental control book and steam tables. No notes or solved problems permitted.
16-Mec-B3, Energy Conversion and Power Generation	2	CLOSED	NONE
16-Mec-B4, Integrated Manufacturing Systems	3	OPEN	NONE
16-Mec-B5, Product Design and Development	2	OPEN	NONE
16-Mec-B6, Fluid Machinery	2	CLOSED	Drawing instruments (scale ruler, protractor and sharp pencil) are required for vector diagrams.
16-Mec-B7, Aero and Space Flight	2	OPEN	NONE
16-Mec-B8, Engineering Materials	2	OPEN	NONE
16-Mec-B9, Advanced Engineering Structures	2	OPEN	NONE
16-Mec-B10, Finite Element Analysis	3	OPEN	NONE
16-Mec-B12, Robot Mechanics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.

Name of Subject Metallurgical	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
10-Met-A6, Phase Transformation and Thermal Treatment of Metals and Alloys	2	CLOSED	NONE
10-Met-A7, Corrosion and Oxidation	3	OPEN	NONE

Name of Subject Mechatronics	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
16-Mex-A1, System Analysis and Control	2	CLOSED	NONE
16-Mex-A2, Circuits	2	CLOSED	NONE
16-Mex-B8, Engineering Materials	3	OPEN	NONE

Name of Subject Manufacturing	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
08-Mfg-A3, Production Management	2	CLOSED	NONE
08-Mfg-A4, Analysis and Design of Work	2	CLOSED	NONE
08-Mfg-A5, Facilities Planning	2	CLOSED	NONE
08-Mfg-A6, Quality Planning, Control and Assurance	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
08-Mfg-B3, System Simulation	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
08-Mfg-B4, Product Design and Development	2	OPEN	NONE
08-Mfg-B6, Metrology	3	OPEN	NONE
08-Mfg-B8, Robot Mechanics	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
08-Mfg-B10, Tooling, Jigs and Fixture Design	3	OPEN	NONE
08-Mfg-B12, Ergonomics	3	OPEN	NONE

Name of Subject Mining and Mineral Processing	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
18-MMP-A1, General Geology and Exploration	2	CLOSED	NONE
18-MMP-A2, Underground Mining Methods & Design	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
18-MMP-A3, Mineral Processing	2	CLOSED	NONE
18-MMP-A4, Mine Valuation and Mineral Resource Estimation	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
18-MMP-A6, Mining and the Environment	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.

Name of Subject Materials	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
12-Mtl-A1, Materials Thermodynamics	3	OPEN	NONE

Name of Subject Naval Architecture	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
16-Nav-A2, Hydrodynamics of Ships (1): Resistance and Propulsion	2	CLOSED	NONE

Name of Subject Nuclear	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
08-Nuc-A1, Introduction to Nuclear Physics and Nuclear Engineering	2	OPEN	NONE
08-Nuc-A6, Nuclear Power Plant Systems & Operations	2	CLOSED	NONE

Name of Subject Petroleum	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
17-Pet-A2, Petroleum Reservoir Fluids	2	CLOSED	NONE

17-Pet-A3, Fundamental Reservoir Engineering	2	CLOSED	NONE
17-Pet-A4, Oil and Gas Well Drilling and Completion	3	OPEN	NONE
17-Pet-A5, Petroleum Production Operations	3	OPEN	NONE
17-Pet-A6, Reservoir Mechanics	3	OPEN	NONE
17-Pet-A7, Secondary and Enhanced Recovery	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.

Name of Subject Engineering Physics	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
17-Phys-A4, Quantum Mechanics	2	CLOSED	NONE
17-Phys-A5-A, Electronic Materials and Devices	2	CLOSED	NONE
17-Phys-A5-B, Analog and Digital Electronic Circuits	3	OPEN	NONE
17-Phys-A6, Solid State Physics	2	CLOSED	NONE
17-Phys-A7, Optics	2	CLOSED	NONE
17-Phys-B5, Systems and Control	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae. <u>The aid sheet must be signed and submitted with the written exam paper.</u>
17-Phys-B6, Applied Thermodynamics and Heat Transfer	3	OPEN	Candidates are expected to have copies of both a thermodynamics text AND a heat transfer text in order to make use of the information presented in the tables and graphs. Candidates MUST write the name and model number of their calculator on the inside front cover of the exam book.

Name of Subject Software	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
19-Soft-A3, Software Design	2	CLOSED	Candidates are allowed to bring TWO aid sheets 8.5" X 11" hand-written on both sides containing notes and formulae

19-Soft-A4, Real Time Systems	2	CLOSED	NONE
04-Soft-A5, Requirements and Specifications	1	OPEN	One textbook of candidates choice
04-Soft-A7, Software Process	2	CLOSED	Candidates are allowed to bring TWO aid sheets 8.5" X 11" hand-written on both sides containing notes and formulae
19-Soft-B6, Software Project Management	3	OPEN	NONE

Name of Subject Structural	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
07-Str-A1, Elementary Structural Analysis	2	CLOSED	NONE
07-Str-A2, Elementary Structural Design	2	CLOSED	Handbooks and textbooks are permitted. <u>NO notes or loose sheets are allowed.</u> Candidates MUST write the name and model number of their calculator on the inside front cover of the exam book. Note: The solutions for Standards of Steel, Concrete & Timber must come from the latest manual editions.
17-Str-A3, Geotechnical Materials and Analysis	2	CLOSED	NONE
07-Str-A4, Advanced Structural Analysis	2	CLOSED	NONE
07-Str-A6-1, The Finite Element Method	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
07-Str-A6-3, Earthquake Engineering	3	OPEN	NONE
07-Str-B1, Geotechnical Design	3	OPEN	It is to the candidate's advantage to bring the Canadian Foundation Manual.
07-Str-B2, Management of Construction	2	CLOSED	NONE
07-Str-B5, Foundation Engineering	3	OPEN	NONE
07-Str-B11, Hydraulic Engineering	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.

Name of Subject Transportation	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
07-Tra-A2, Highway Design	3	OPEN	NONE
07-Tra-A6, Geotechnical Materials and Analysis	2	CLOSED	NONE

Name of Subject Water Resources	Format 1,2, or 3	Closed or Open Book	Aids/Instructions to the Candidates
07-Wrse-A2, Engineering Hydrology	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.
07-Wrse-A3, Soil Mechanics & Groundwater	3	OPEN	NONE
07-Wrse-B3, Water Supply & Wastewater Treatment	2	CLOSED	Candidates are allowed to bring ONE aid sheet 8.5" X 11" hand-written on both sides containing notes and formulae.