Electrical Engineering Syllabus - 1998

INTRODUCTION

Seventeen engineering disciplines are included in the Examination Syllabus issued by the Canadian Engineering Qualifications Board of the Canadian Council of Professional Engineers.

Each discipline examination syllabus is divided into two examination categories: compulsory and elective. A full set of Electrical Engineering examinations consists of nine, three-hour examination papers. Candidates will be assigned examinations based on an assessment of their academic background. Examinations from discipline syllabi other than those specific to the candidates' discipline may be assigned at the discretion of the constituent Association/Ordre.

Before writing the discipline examinations, candidates must have passed, or been exempted from, the Basic Studies Examinations.

Information on examination scheduling, textbooks, materials provided or required, and whether the examinations are open or closed book, will be supplied by the constituent Association/Ordre.

ELECTRICAL ENGINEERING EXAMINATIONS

GROUPA

COMPULSORY EXAMINATIONS (SEVEN REQUIRED)

98-Elec-A1 Circuits

Nodal and mesh analysis of linear, finite, passive circuits; equivalent networks. Steady state AC response of lumped constant, time-invariant networks. Time and frequency response of linear systems: impulse response and transfer functions, Laplace transform analysis, frequency response, including steady-state sinusoidal circuits.

98-Elec-A2 Control

Models, transfer functions, and system response. Root locus analysis and design. Feedback and stability: Bodes diagrams. Nyquist criterion, frequency domain design. State variable representation.
Simple PID control systems.

98-Elec-A3 Communications

Amplitude and frequency modulation systems: signals, spectra, implementation. Sampling of continuous signals and the Nyquist sampling theorem. Fourier series and transforms, spectral concepts. Discrete signals and systems: the sampling theorem, time and frequency response, the Z-transform. PCM and simple baseband pulse code modulation systems.

98-Elec-A4 Digital Systems and Computers

Combinatorial and sequential switching circuits. Register level design of digital systems. Computer memories. Computer architecture, assembly language programming, interrupts, and interfacing.

98-Elec-A5 Electronics

Semiconductor devices; diodes and thyristors. Bipolar and field effect transistors as linear devices and switches. Small signal amplifiers. Operational amplifiers and comparators. Digital circuits and logic families. Small signal amplifiers. Digital circuits and logic families.

98-Elec-A6 Electromagnetic Energy Conversion

Magnetic circuits. Three - phase circuits. Transformer equivalent circuit at both low frequency and high frequency. Electromagnetic and electrostatic force calculations. AC machines and stepper motors. Permanent magnet DC machines.

98-Elec-A7 Electromagnetics

Field concepts. Maxwell's equations. Free space and guided wave propagation, transmission lines. Radiation from current elements.

GROUPB

ELECTIVE EXAMINATIONS (TWO REQUIRED)

98-Elec-B1 Advanced Circuits Analysis and Design

Network equilibrium equations. Two port analysis. Classical passive filter design. Non linear operational amplifier applications and active filters. Principles of computer aided design tools: frequency and time domain analysis; transmission line effects; sensitivity analysis. Scattering matrix description of microwave devices.

98-Elec-B2 Digital Signal Processing

Discrete system theory: convolution, Z-transforms, transfer functions. Design and implementation ofdigital filters. Spectral analysis, DFT and FFT implementations. Implementation; DSP chips architecture and programming.

98-Elec-B3 Advanced Control Systems

Modelling of engineering systems; state variables and transfer function representations. Analytical and numerical solutions of state variable equations. Observability, controllability, stability; classical design, stabilization by pole assignment. Systems with delay. Systems with noise. Computer control, discrete systems. System identification; least squares.

98-Elec-B4 Communications Systems

Sampling, A/D conversion, source coding; signal sets, line codes, modulation, optimal reception, demodulation, performance in noisy channels, error detecting and correcting codes. Public Switch Telephone Networks, television standards. Radio communications; link analysis and performance, terrestrial and satellite communications; personal communication networks; cellular telephone networks.

98-Elec-B5 Advanced Electronics

Device models and implementation in computer aided analysis packages. Multi-stage amplifiers, oscillators, non-linear circuits. Power amplifiers and linear regulators. Communication circuits; phase locked loops, filters, modulator/demodulators. Electronic instrumentation and measurement. Microwave circuits; properties of microwave tubes and semi-conductor devices.

98-Elec-B6 Integrated Circuit Engineering

Integrated Circuit Design: MOS circuit design methods; specification; use of CAD design tools. Non-ideal effects. Mask level layout. Integrated Circuit Fabrication: basic knowledge of IC processing techniques. Digital and analog IC's: basic building blocks. Design considerations for submicron CMOS and bipolar devices.

98-Elec-B7 Power Systems Engineering

Power system representation and analysis. Components: transmission lines, transformers, synchronous machines. Distribution: loads, power flow, operations, and control. Fault analysis: short circuits, balanced and unbalanced operation. System stability.

98-Elec-B8 Switched Mode Power Supply Design

Control of electrical power with semiconductor devices -- Specifications and requirements. Design of high frequency magnetic devices. Power supply models and control methods. Harmonic analysis. Filter design and EMC issues. Heat sink calculations.

98-Elec-B9 Power Electronics and Drives

Construction and modelling of electric machines; induction, synchronous, permanent magnet DC, stepper motors. Electronic power converters; choppers, DC link inverters, cycloconverters, current source inverters. Torque and speed controllers. Vector oriented control techniques.

98-Elec-B1O Electromagnetic Field, Transmission Lines, Antennas, and Radiation

Field radiation equations. Distributed circuits: steady-state transmission line equations; impedance transformation, Smith charts, matching. Transients. Coaxial lines, waveguides. Antennas: infinitesimal elements, linear antennas, radiation resistance, antenna patterns, gain. Other types of antennas.

98-Elec-B11 Electro-Optical Engineering

Optical transmission: waveguide modes, fibre optic propagation characteristics. Optoelectronics: lasers, sources and detectors, couplers, modulators, guided wave devices. Applications.

1998 PEO ELECTRICAL ENGINEERING Examinations Text List

98-Elec-A1, Circuits

Johnson, Electric Circuit Analysis, 3rd edition. Prentice-Hall.

98-Elec-A2, Control

Dorf, Modern Control Systems, 8th edition. Addison-Wesley.

98-Elec-A3, Communications

Oppenheimer, Signals and Systems, 2nd edition. Prentice-Hall.

98-Elec-A4, Digital Systems and Computers

Brey, The Motorola Microprocessor Family, Saunders College Publishing.

98-Elec-A5, Electronics

Sedra and Smith, Microelectronic Circuits, 4th edition. Oxford University Press

98-Elec-A6, Electromagnetic Energy Conversion

Chapman, Electric Machinery Fundamentals, McGraw-Hill.

98-Elec-A7, Electromagnetics

Demarest, Engineering Electromagnetics, Prentice-Hall.

Staelin, D.R., Morgenthaler, A.W. and Kong, J.A., Electromagnetic Waves, Prentice Hall, 1994.

98-Elec-B1, Advanced Circuits Analysis and Design

Sedra and Smith, Microelectronic Circuits, 4th edition, Oxford.

98-Elec-B2, Digital Signal Processing

Jackson, Kluwer, Digital Filters and Signal Processing.

98-Elec-B3, Advanced Control Systems

Dutton, The Art of Control Engineering, Addison-Wesley.

98-Elec-B4, Communications Systems

Tanenbaum, Computer Networks, 3rd edition, Prentice-Hall.

98-Elec-B5, Advanced Electronics

Sedra and Smith, Microelectronic Circuits, 4th edition. Oxford.

98-Elec-B6 - Integrated Circuit Engineering

Jan A Rabaey, Digital Integrated Circuits, Prentice-Hall.

98-Elec-B7, Power Systems Engineering

Elements of Power System Analysis, 4th edition, McGraw-Hill.

98-Elec-B8 - Switched Mode Power Supply Design

Billings, Switched Mode Power Supply Handbook, McGraw-Hill.

98-Elec-B9, Power Electronics and Drives

Slemon, Electric Machines and Drives, Addison-Wesley.

98-Elec-B10, Electromagnetic Field, Transmission Lines, Antennas, and Radiation

Demarest, Engineering Electromagnetics, Prentice-Hall.

98-Elec-B11, Electro-Optical Engineering

Yariv, Optical Electronics, Saunders College Publishing.