CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS
ATLANTIC PROVINCES BOARD OF EXAMINERS FOR LAND SURVEYORS

SCHEDULE I / ITEM 1
MATHEMATICS

October 2006

Note: This examination consists of 10 questions on 1 page.

Time: 3 hours

Q. No		Marks Value	Earned
1	a. In Cartesian coordinates x and y, what is the equation of a circle of radius r with centre at (x_o, y_o)?	5	
	b. For some arbitrary point (x_1, y_1) on the previous circle, what is the equation of the tangent line?	5	
2	a. For two arbitrary vectors $\vec{\mathbf{u}}$ and $\vec{\mathbf{v}}$, what is a formula for the angle between them?	5	
	b. How can the preceding angle formula be used to check for orthogonality and parallelism of the vectors $\vec{\mathbf{u}}$ and $\vec{\mathbf{v}}$?	5	
3	a. Given a complex function $w = \sin^2 z$ for $z = x + iy$, what are the real and imaginary parts of w?	5	
	b. What are the magnitude and argument of the preceding complex function w?	5	
4	a. For a small matrix A with elements $a_{11} = a_{22} = 2$, $a_{12} = a_{21} = 1$, what is the determinant of A?	5	
	b. What are the eigenvalues of the preceding matrix A?	5	
5	a. For a small matrix B with elements $b_{11} = b_{22} = 2$, $b_{12} = b_{21} = b_{13} = b_{23} = 1$, what are BB^T and B^TB?	5	
	b. Which one of the preceding BB^T and B^TB is invertible? What is its inverse?	5	
6	a. Expand $(2x - 3)^{-1}$ into a power series in terms of x. Evaluate the first 3 terms only.	5	
	b. What can be said about the convergence of the corresponding series for $(2x - 3)^{-1}$?	5	
7	a. Given three equations $x + y + z = 5.5$, $x + 2y + 3z = 9.2$, $x + 3y + 8z = 17$, what are x, y and z by Gaussian elimination?	5	
	b. What are the x, y and z by applying Cramer's rule to the preceding equations?	5	
8	a. Given some complex transformation $w(z) = e^z$, what is the corresponding inverse complex transformation?	5	
	b. What are the real and imaginary parts of the preceding inverse complex function?	5	
9	a. For some function f(x), $d^2f(x)/dx^2 = \sin x$, then what is the general solution f(x)?	5	
	b. For the preceding differential equation and initial conditions $f(0) = 1$ and $df(0)/dx = 0$, what is the solution f(x)?	5	
10	a. For a function g(x,y), $\partial g(x,y)/\partial x = x \cos y$, what is the general solution g(x,y)?	5	
	b. For the preceding partial differential equation and initial conditions $g(0,0) = 1$, what is the solution g(x,y)?	5	
	Total Marks:	**100**	