CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS

C-1 MATHEMATICS

March 2013

Note: This examination consists of ten questions on one page. **Marks**

Time: 3 hours

Q. No		Value	Earned
1.	a) What is the limit as $x \to 0$ of the expression $\{\sin(3x) + 4\} / \{\cos(5x)+6\}$?	5	
	b) What is the limit as $y \to \infty$ of the expression $\{y^2+3y+4\} /\{2y^3+3y^2+5\}$?	5	
2.	a) What is the derivative of $f(x) = e^{\sin(x)+2}$ with respect to the variable x?	5	
	b) For a complex variable $z=x+iy$, $i=(-1)^{1/2}$, what are the real and imaginary parts of $g(z)=e^{\sin(z)}$?	5	
3.	a) What are the first three terms of the Taylor expansion of x^5+1 about x=1?	5	
	b) What is the remainder after those three terms in the previous Taylor expansion?	5	
4.	a) What is, by integration, the circumference of circle of radius R ?	5	
	b) What is, by integration, the area of a circle of radius R ?	5	
5.	a) Considering two arbitrary vectors **a** and **b** in three-dimensional Cartesian space, how can the angle between them be evaluated?	5	
	b) For the same vectors **a** and **b**, what is their vector product in terms of their magnitudes and the angle between them?	5	
6.	a) What ordinary differential equation is satisfied by the function sin(x) ?	5	
	b) What partial differential equation is satisfied by the function sin(x) cos(y) ?	5	
7.	a) What is the inverse of a diagonal matrix? Illustrate with a small matrix of order 3.	5	
	b) What is the determinant of an upper triangular matrix of order 3? Give a numerical example.	5	
8.	a) What is the difference between symmetric and skew symmetric matrices? Illustrate with small matrices.	5	
	b) What is a positive definite matrix? Give an example.	5	
9.	a) What are the solutions of the equation $x^n = 1$ for n=1, 2, 3 ?	5	
	b) In general, what are the solutions of the equation $x^n = 1$ for positive integer n?	5	
10.	a) On the sphere of radius R in Cartesian (x, y, z) space, what is the transformation from (spherical) latitude φ and longitude λ to x, y, and z?	5	
	b) What is the inverse transformation from x, y, z to φ and λ on the sphere?	5	
	Total Marks:	100	