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

<div align="center">

SCHEDULE I / ITEM 6   **October 2009**
CARTOGRAPHY AND MAP PROJECTIONS

</div>

Although programmable calculators may be used, candidates must show all formulae used, the substitution of values into them, and any intermediate values to 2 more significant figures than warranted for the answer. Otherwise, full marks may not be awarded even though the answer is numerically correct.

Note: This examination consists of 7 questions on 2 pages.   **Marks**

Q. No	Time: 3 hours	Value	Earned
1.	a. What parameters must be maintained in order to match two or more separate maps exactly along their edges?	2	
	b. Give 4 distinct characteristics normally considered in choosing a map projection for any region.	4	
	c. Explain clearly (providing possible scenarios) the term conformality in map projections with regard to shape, angles, point scales, arc-to-chord corrections, and convergence of meridians.	10	
	d. Why do the surveyors compute geodetic positions on a conformal projection plane instead of, for example, on an equal-area or an equidistant map projection plane?	4	
2.	The magnetic declination given on a 1998 (January) Canadian 1:50,000 Topographic Map for an area on the west coast is 20°E decreasing (moving westward) 6′ per year. The geodetic bearing of a hydro line on this map has been determined to be S18°44′30″W. Clearly showing the steps taken to arrive at the result, what is the October 2008 magnetic bearing of the hydro line?	5	
3.	The scale factor (k) at any given point (ϕ, λ) on a UTM projection can be determined using the following formula: $$k = k_0\left[1 + L^2 \frac{\cos^2 \phi}{2}\right]$$ Where $L = \lambda_{CM} - \lambda$, expressed in radians; λ_{CM} is the longitude of the central meridian; k_0 is the scale factor at the central meridian; and ϕ and λ are the latitude and longitude values of the given point. a. At what distance (in degrees, minutes, seconds) away from the central meridian, along the equator, is the UTM scale distortion equal to zero?	5	
	b. If a scaling accuracy ratio of 1:10,000 is to be maintained in the given zone and a modified Transverse Mercator (MTM) projection (similar to UTM) is to be used, determine minimum and maximum scale factors and the maximum width (in degrees, minutes, seconds) of the zone, at the equator.	5	
	c. If the modified Transverse Mercator (MTM) projection zone in (b) above and the UTM zone in (a) have the same central meridian, what is the UTM easting of a point B with a MTM easting of 113,660.42 m (assuming the MTM false Easting is 0.0 m)?	6	
	d. Referring to question (c), would the convergence angle be different at a distance of $L = 0.0175$ radians for the MTM and UTM zones? Explain your answer.	2	

4.	What is cadastral mapping? Explain the problems and issues usually encountered when creating digital cadastral maps from paper manuscripts.	10	
5.	Explain the main characteristics and one important cartographic application of each of the following. a. Spatial data aggregation b. Halftone screen c. Screen tint d. Desktop publishing e. Metadata	5 5 5 5 5	
6.	a. Summarize in a table form, for each of these visual variables (size, orientation, shape, color hue), their suitability for qualitative and quantitative data. (Place visual variables as rows; quantitative and quantitative data as two columns; for various levels of acceptability, use "P" for poor, "M" for marginally effective and "G" for good.) b. Explain with examples, reasons for choosing the visual variables in (a) for the qualitative data. c. List those visual variables in (a) that will be most suitable for line symbolization on maps, giving an example of typical data or feature in each case.	4 6 3	
7.	Explain the following as clearly as possible, stating the important characteristics of each them. a. Web-based interactive cartography b. Geo-browser c. Toporama	3 3 3	
	Total Marks:	100	