

**CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS**  
**E-2 HYDROGRAPHIC SURVEYING**

**October 2011**

**Note: This examination consists of 9 questions on 1 page.**

**Marks**

<u>Q. No</u>	<u>Time: 3 hours</u>	<u>Value</u>	<u>Earned</u>
1.	Define the following in one or two sentences: a) Thermocline b) Transducer c) Cleared Depth d) Heave, pitch and roll e) LIDAR f) Seiche g) DGPS h) Chart Datum i) Ellipsoid j) Snell's Law	2 2 2 2 2 2 2 2 2 2	
2.	a) Name the three ocean parameters that effect sound velocity in the ocean. b) On the same plot, draw two typical sound speed profiles in the open ocean, one at the equator, and the other in the arctic. c) Which parameter has the greatest effect in the upper (near surface) region? d) Which parameter has the greatest effect in the lower (towards bottom) region?	2.5 2.5 2.5 2.5	
3.	With the help of a diagram, describe the components necessary for reducing water depth measurements from a singlebeam transducer face to a chart datum. Describe three of the main sources of vertical uncertainty involved in this reduction.	4 6	
4.	In relation to acoustic signals and transducer design, describe: a) The relationship between frequency, wavelength and speed of sound. b) Bandwidth c) Pulse Length d) Detection Threshold	2.5 2.5 2.5 2.5	
5.	Specific to hydrographic applications, describe the difference between Multibeam Sonars and Side Scan Sonars. Include a discussion of what each would be used for and why.	5	
6.	Explain each of the following: a) With the aid of diagrams/sketches describe thoroughly the tidal effects caused by the sun-moon-earth interaction. b) Why is the tidal range in the Bay of Fundy much larger than in the mid-Atlantic? c) Tidal data analysis involves both harmonic and non-harmonic constituents.	5 5 5	
7.	Describe four different horizontal positioning systems/methods used in hydrography. Include: positioning type, observables, measurement instrumentation, sources of uncertainty, expected uncertainty	10	
8.	With the help of a diagram, describe the various vertical datums used in hydrographic operations. Explain what each datum is used for and how it is related to the others	10	
9.	A detailed large scale hydrographic survey is required for the construction of a pier to be used mainly for loading/offloading container vessels and bulk carriers. The area of coverage is rectangular in shape approximately 1500 m x 1000 m. Your company is going to submit a proposal (bid) to conduct the survey and you are part of a team preparing the submission. Compile a list of questions/issues that you would address in order to prepare the documentation	10	
<b>Total Marks:</b>		<b>100</b>	