

National Exams

04-Geom-B4, Hydrography

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a CLOSED BOOK EXAM.
Any non-communicating calculator is permitted.
3. FOUR (4) questions constitute a complete exam paper.
The first four questions as they appear in the answer book will be marked.
4. Each question is of equal value.
5. Most questions require an answer in essay format. Clarity and organization of the answer are important.

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1. (25%) You have recently purchased a bathymetric Lidar and you would like to verify the performance specifications of the system.
 - a. How would you verify the system accuracy and depth penetration? Show all details.
 - b. How can you verify the system's ability for hazard detection?
 - c. Can you use a Lidar system for seafloor classification? Explain why or why not?

2. (25%) Recently, the issue of hydrographic surveying on tidal datums with kinematic GPS has evolved, which takes advantage of the GPS-derived height. Explain how this could be achieved. What are the advantages of this method over classical hydrography? What are the limitations, if any?

3. (25%) You are to conduct a hydrographic surveying operation with a single-beam echo-sounder in an area where suspended sediment layers exist.
 - a. What frequency range would you choose for your project? Why? Name three single-beam echo-sounders that can be used for this project.
 - b. Explain one method for calibrating your echo-sounder.
 - c. What are the error sources and limitations you expect to encounter? Can you overcome them?

4. (25%) In multibeam echo-sounding surveys, the patch test is used to detect the systematic errors in the components of the vessel attitude as well as the time offset between the positioning system and the sounder, for a particular installation. Explain how each of the following tests is carried out:
 - a. pitch bias resolution.
 - b. time offset resolution.
 - c. roll bias resolution.
 - d. heading bias resolution.

5. (25%) Explain, with the help of a diagram if necessary, each of the following terms:
- a. Lead-line method.
 - b. Induced heave.
 - c. shoal-biased surfaces.
 - d. Secchi disk.
 - e. -3 dB points.

Marking Scheme

1. (a) 12 marks
(b) 7 marks
(c) 6 marks
2. 25 marks total (15 marks for explanation; 5 marks for advantages; 5 marks for limitations)
3. (a) 8 marks
(b) 7 marks
(c) 10 marks
4. (a) 7.5 marks
(b) 7.5 marks
(c) 7.5 marks
(d) 7.5 marks
5. (a) 5 marks
(b) 5 marks
(c) 5 marks
(d) 5 marks
(e) 5 marks